# METHOD AND DEVICE FOR REGENERATING WOBBLE SIGNAL OF OPTICAL DISK

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## Abstract

PROBLEM TO BE SOLVED: To always regenerate a precise wobble signal with simple constitution. SOLUTION: A quadripartite photodetector 11 is divided into two parts in the left/right directions of a track on an optical disk, and the level of a composite signal V1 outputted from one side photodetectors 11a, 11b is changed based on a control voltage Vcon. A difference signal V5 having the level of a difference between the level-changed signal V4 and the level of the composite signal V2 outputted from the other side photodetectors 11c, 11d is generated, and the difference signal V5 is made the control voltage Vcon through a low-pass filter 34 when an EFM signal is a high level based on the EFM signal regenerated from an RF signal obtained from reflection light from an optical disk, and the difference signal V5 is regenerated as the wobble signal WB through a band-pass filter 35. Thus, the wobble signal without noise and EFM signal components is regenerated.

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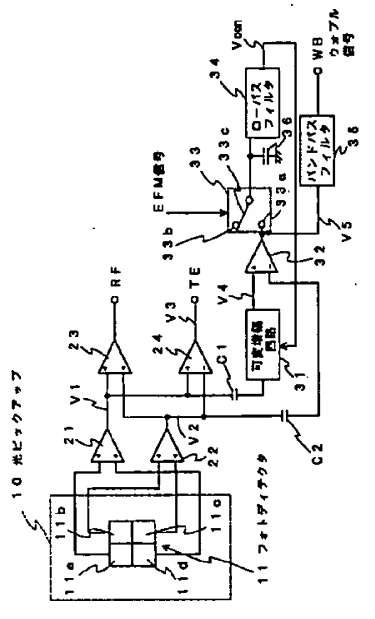
(54)【発明の名称】　光ディスクのウォブル信号再生方法及びその装置

(57)【要約】

【課題】　簡単な構成により常に正確なウォブル信号を再生できる光ディスクのウォブル信号再生方法及びその装置を提供する。

【解決手段】　４分割されたフォトディテクタ１１を光ディスクのトラックの左右方向に２分割し、一方の側のフォトディテクタ１１ａ，１１ｂから出力される合成信号Ｖ１のレベルを制御電圧Ｖconに基づいて変化させ、このレベル変化された信号Ｖ４と他方の側のフォトディテクタ１１ｃ，１１ｄから出力される合成信号Ｖ２のレベルとの差のレベルを有する差信号Ｖ５を生成し、光ディスクの反射光から得られたＲＦ信号から再生されたＥＦＭ信号に基づいて、ＥＦＭ信号がハイレベルのときに差信号Ｖ５をローパスフィルタ３４を通して制御電圧Ｖconとなし、差信号Ｖ５をバンドパスフィルタ３５を通してウォブル信号ＷＢとして再生する。これにより、ノイズ及びＥＦＭ信号成分を含まないウォブル信号を再生できる。



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【特許請求の範囲】

【請求項１】　絶対時間情報に基づいて蛇行して形成されたトラックを有し、該トラックにそってピットが形成された光ディスクからの反射光を少なくとも前記トラックの左右方向に２分割されたフォトディテクタを用いて検出し、該検出結果から前記トラックの蛇行に対応して変化するウォブル信号を再生する光ディスクのウォブル信号再生方法において、

前記２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルを制御信号に基づいて変化させ、

該レベル変化された信号と他方のフォトディテクタから出力される信号のレベルとの差のレベルを有する差信号を生成し、

前記反射光から得られたＥＦＭ信号に基づいて、前記差信号をサンプルホールドした後、

該サンプルホールド信号を低域フィルタを通して前記制御信号となし、

前記差信号を帯域フィルタを通してウォブル信号として再生することを特徴とする光ディスクのウォブル信号再生方法。

【請求項２】　絶対時間情報に基づいて蛇行して形成されたトラックを有し、該トラックにそってピットが形成された光ディスクからの反射光を少なくとも前記トラックの左右方向に２分割されたフォトディテクタを用いて検出し、該検出結果から前記トラックの蛇行に対応して変化するウォブル信号を再生する光ディスクのウォブル信号再生方法において、

前記２分割されたフォトディテクタの両方のフォトディテクタから出力される信号のレベルを第１制御信号及び第２制御信号に基づいてそれぞれ変化させ、

該レベル変化された信号レベルの差のレベルを有する差信号を生成し、

前記反射光から得られたＥＦＭ信号に基づいて、前記差信号をサンプルホールドした後、

該サンプルホールド信号を低域フィルタを通して前記第１制御信号となすと共に、

該第１制御信号を反転して前記第２制御信号となし、

前記サンプルホールド信号を帯域フィルタを通してウォブル信号として再生することを特徴とする光ディスクのウォブル信号再生方法。

【請求項３】　絶対時間情報に基づいて蛇行して形成されたトラックを有し、該トラックにそってピットが形成された光ディスクからの反射光を少なくとも前記トラックの左右方向に２分割されたフォトディテクタを用いて検出し、該検出結果から前記トラックの蛇行に対応して変化するウォブル信号を再生する光ディスクのウォブル信号再生装置において、

前記２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルを制御信号に基づいて変化させて出力する可変増幅回路と、

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前記２分割されたフォトディテクタの他方のフォトディテクタから出力される信号のレベルと前記可変増幅回路の出力信号のレベルとの差のレベルを有する信号を出力する減算回路と、

前記光ディスクからの反射光から得られたＥＦＭ信号に基づいて、前記減算回路の出力信号をサンプルホールドするサンプルホールド回路と、

該サンプルホールド回路の出力信号における所定周波数以下の周波数成分のみを前記制御信号として出力する低域フィルタと、

前記減算回路の出力信号を入力し、該信号におけるウォブル信号の周波数を含む所定周波数帯域内の周波数の信号を出力する帯域フィルタとを備えたことを特徴とする光ディスクのウォブル信号再生装置。

【請求項４】　絶対時間情報に基づいて蛇行して形成されたトラックを有し、該トラックにそってピットが形成された光ディスクからの反射光を少なくとも前記トラックの左右方向に２分割されたフォトディテクタを用いて検出し、該検出結果から前記トラックの蛇行に対応して変化するウォブル信号を再生する光ディスクのウォブル信号再生装置において、

前記２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルを第１制御信号に基づいて変化させて出力する第１の可変増幅回路と、

前記２分割されたフォトディテクタの他方のフォトディテクタから出力される信号のレベルを第２制御信号に基づいて変化させて出力する第２の可変増幅回路と、

前記第１の可変増幅器の出力信号レベルと前記第２の可変増幅回路の出力信号レベルとの差のレベルを有する信号を出力する減算回路と、

前記光ディスクからの反射光から得られたＥＦＭ信号に基づいて、前記減算回路の出力信号をサンプルホールドするサンプルホールド回路と、

該サンプルホールド回路の出力信号における所定周波数以下の周波数成分のみを前記第１制御信号として出力する低域フィルタと、

前記第１制御信号を反転して前記第２制御信号として出力する反転回路と、

前記サンプルホールド回路の出力信号を入力し、該信号におけるウォブル信号の周波数を含む所定周波数帯域内の周波数の信号を出力する帯域フィルタとを備えたことを特徴とする光ディスクのウォブル信号再生装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、光ディスクの情報記録再生装置に用いられるウォブル信号再生方法及びその装置に関するものである。

【０００２】

【従来の技術】従来、追記型光ディスク（ＣＤ－ＷＯ）

等の記録可能な光ディスク１には、図２に示すようにその記録領域に予め僅かな振幅でうねっている（蛇行している）トラック２がスパイラル状に形成されている。このトラックのうねりは、ＡＴＩＰ（Absolute Time In Pregroove）データと呼ばれる絶対時間情報を表すものであり、22.05KHzを基本周波数とし、その周波数はＡＴＩＰデータの１ビットに対応する長さ（周波数44.1KHzの７周期分）毎にビットの内容、即ちこのビットが「１」であるか「０」であるかに応じて±１ＫＨｚ変化するようにＦＳＫ(Frequency Shift Keying)変調されている。

【０００３】また、ＡＴＩＰデータは、１フレームが１定数（８４ビット）のビットを含み且つ所定の位置に固定パターンのフレーム同期信号を備えたビット列からなる多数の連続したフレームで構成され、各フレームは周波数７５Ｈｚの周期で繰り返されている。

【０００４】一方、前述した記録可能な光ディスクに音声、映像等の情報を記録する場合は、曲のチャンネル数、プリエンファシスの有無、曲の番号、曲の始まりからの時間、ディスク最内周からの絶対時間等を表す制御情報、即ちサブコードデータも同時に記録される。このサブコードデータは、１フレームが一定数（９８ビット）のビット（但し、１ビットに対応する単位長さはＡＴＩＰデータとの場合とは異なる）を含み且つ所定の位置に固定パターンのフレーム同期信号を備えたビット列からなる多数のフレームで構成され、各フレームは周波数７５Ｈｚの周期で記録される。

【０００５】ここで、実際に光ディスクに情報を記録する場合には、ＡＴＩＰデータとサブコードデータとをフレーム同期させて記録しなければならないことが規格により定められているため、ＡＴＩＰデータを再生する必要がある。このため、従来ＡＴＩＰデータを再生する際には、前述したうねりを検出してうねりの周期を有するアナログ信号（ウォブル信号）として再生し、アナログＰＬＬ回路等を用いたＦＳＫ復調回路によって復調を行っていた。

【０００６】しかし、ウォブル信号の再生においては、次のような問題点があった。

【０００７】即ち、トラッキング誤差信号は、光ピックアップのフォトディテクタ上で光ディスクより反射された戻り光の左右の差を取ったものである。従って、対物レンズが光ディスクの偏芯に追従して移動した場合、当然光ピックアップ内のフォトディテクタ上でも戻り光のスポットは左右に移動する。ここで、戻り光にノイズがある場合を考えると、各フォトディテクタへの入射光強度が全て同レベルであるならば、トラッキング誤差信号にノイズが重畳することはないが、左右の入射光強度のレベルが異なるときは、トラッキング誤差信号にノイズやＥＦＭ信号成分が重畳して、ウォブル信号ＷＢのＣ／Ｎを低下させてしまう。

【０００８】例えば、前述したような追記型の光ディスクには、情報が記録された領域と、未記録の領域が存在し、情報が記録されている領域においてウォブル信号を再生する場合、光ディスクに偏芯等があればウォブル信号に記録情報の信号成分、即ちＥＦＭ信号成分が重畳してＣ／Ｎを低下させ、正確にＡＴＩＰデータを再生できず、サーチに大きな支障をきたして動作不良を引き起こしてしまう。

【０００９】このような、動作不良を低減するために、例えば、１ビームプッシュプル法では、特開平６－４４５６８号公報に開示されるような回路構成でウォブル信号を再生していた。

【００１０】即ち、ウォブル信号再生装置は、図３に示すように、加算器７１Ａ，７１Ｂ、減算器７２Ａ，７２Ｂ、結合コンデンサ７３Ａ～７３Ｃ、可変増幅回路７４、クランプ回路７５Ａ，７５Ｂ、ピークホールド回路７６Ａ，７６Ｂ、増幅回路７７、バンドパスフィルタ（ＢＰＦ）７８から構成されている。

【００１１】また、１０は光ピックアップで、光ディスクからの反射光を受光するフォトディテクタ１１としては、周知の４分割のフォトディテクタ１１が用いられている。また、トラックの左側に位置するディテクタ１１ａ、１１ｄの合計受光量及び右側に位置するディテクタ１１ｂ，１１ｃの合計受光量に対応する電圧Ｖ１，Ｖ２が加算増幅器７１Ａ，７１Ｂによって生成される。

【００１２】ここで、電圧Ｖ１，Ｖ２においては、光ディスクからの反射光ビームの光量が所定範囲でピットに応じて変化し、且つグループが光ビームの半径方向に変化することにより、所定のレベルだけバイアスされた状態でピットに応じて信号レベルが短い周期で変化し、さらに全体の信号レベルがグループに応じて変動する。

【００１３】一方、電圧Ｖ１は結合コンデンサ７３Ａを介して可変増幅回路７４に入力され、電圧Ｖ２は結合コンデンサ７３Ｂを介して信号Ｓ２としてクランプ回路７５Ｂ及び減算機７２Ａの非反転入力端子に入力されている。

【００１４】また、可変増幅回路７４からの出力信号Ｓ１は結合コンデンサ７３Ｃを介してクランプ回路７５Ａ及び減算機７２Ａの反転入力端子に入力されている。

【００１５】クランプ回路７５Ａの出力信号はピークホールド回路７６Ａを介して信号Ｓ３として減算機７２Ｂの反転入力端子に入力され、クランプ回路７５Ｂの出力信号はピークホールド回路７６Ｂを介して信号Ｓ４として減算機７２Ｂの非反転入力端子に入力されている。さらに、減算機７２Ｂの出力信号Ｓ５は増幅器７７によって増幅された後、可変増幅回路７４に制御信号として入力される。

【００１６】また、減算機７２Ａの出力信号をバンドパスフィルタ７８に通すことによってウォブル信号ＷＢを再生している。

【００１７】前述の構成によれば、ピットに応じて変化

するＲＦ成分の信号レベルが入力信号Ｓ１及びＳ２間で等しくなるように入力信号Ｓ１の信号レベルを補正した後、これらの差信号を生成して、ウォブル信号ＷＢとして再生しているので、光りピックアップ１０に対する反射光ビームの入射位置が経年変化等で変化した場合でも、ウォブル信号ＷＢへのＲＦ成分の混入を低減することができる。

【００１８】

【発明が解決しようとする課題】しかしながら、前述した従来のウォブル信号再生装置は、構成が複雑であると共に、部品点数が増えてコスト高になるという問題点があった。

【００１９】本発明の目的は上記の問題点に鑑み、簡単な構成により常に正確なウォブル信号を再生できる光ディスクのウォブル信号再生方法及びその装置を提供することにある。

【００２０】

【課題を解決するための手段】本発明は上記の目的を達成するために請求項１では、絶対時間情報に基づいて蛇行して形成されたトラックを有し、該トラックにそってピットが形成された光ディスクからの反射光を少なくとも前記トラックの左右方向に２分割されたフォトディテクタを用いて検出し、該検出結果から前記トラックの蛇行に対応して変化するウォブル信号を再生する光ディスクのウォブル信号再生方法において、前記２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルを制御信号に基づいて変化させ、該レベル変化された信号と他方のフォトディテクタから出力される信号のレベルとの差のレベルを有する差信号を生成し、前記反射光から得られたＥＦＭ信号に基づいて、前記差信号をサンプルホールドした後、該サンプルホールド信号を低域フィルタを通して前記制御信号となし、前記差信号を帯域フィルタを通してウォブル信号として再生する光ディスクのウォブル信号再生方法を提案する。

【００２１】該光ディスクのウォブル信号再生方法によれば、情報の記録再生対象となる光ディスクからの反射光を受光する２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルは制御信号によってそのレベルが変化される。さらに、このレベル変化された信号のレベルと、他方のフォトディテクタから出力された信号のレベルとの差のレベルを有する差信号が生成され、該差信号を帯域フィルタを通すことによりウォブル信号が再生される。ここで、前記制御信号は、光ディスクからの反射光から得られたＥＦＭ信号に基づいて前記差信号がサンプルホールドされ、さらに低域フィルタを通して生成され、ＥＦＭ信号に対応して前記一方のフォトディテクタからの出力信号レベルを変化させ、双方のフォトディテクタからの出力信号レベルのオフセットをほぼ同レベルにしているので、前記２つのフォトディテクタから出力される双方の信号のノイズ成分、即ち双方の信号において同相であるＥＦＭ信号成分が相殺され、ウォブル信号におけるノイズ成分が低減或いは除去される。

【００２２】また、請求項２では、絶対時間情報に基づいて蛇行して形成されたトラックを有し、該トラックにそってピットが形成された光ディスクからの反射光を少なくとも前記トラックの左右方向に２分割されたフォトディテクタを用いて検出し、該検出結果から前記トラックの蛇行に対応して変化するウォブル信号を再生する光ディスクのウォブル信号再生方法において、前記２分割されたフォトディテクタの両方のフォトディテクタから出力される信号のレベルを第１制御信号及び第２制御信号に基づいてそれぞれ変化させ、該レベル変化された信号レベルの差のレベルを有する差信号を生成し、前記反射光から得られたＥＦＭ信号に基づいて、前記差信号をサンプルホールドした後、該サンプルホールド信号を低域フィルタを通して前記第１制御信号となすと共に、該第１制御信号を反転して前記第２制御信号となし、前記サンプルホールド信号を帯域フィルタを通してウォブル信号として再生する光ディスクのウォブル信号再生方法を提案する。

【００２３】該光ディスクのウォブル信号再生方法によれば、情報の記録再生対象となる光ディスクからの反射光を受光する２分割されたフォトディテクタの双方のフォトディテクタから出力される信号のレベルは第１及び第２制御信号によってそのレベルが変化される。また、このレベル変化された信号レベルの差のレベルを有する差信号が生成され、該差信号を光ディスクからの反射光から得られたＥＦＭ信号に基づいてサンプルホールドし、さらに該サンプルホールドした信号を帯域フィルタを通すことによりウォブル信号が再生される。また、前記第１制御信号は前記サンプルホールドされた信号を低域フィルタを通すことにより生成され、前記第２制御信号は前記第１制御信号を反転することにより生成される。ここで、前記第１及び第２制御信号は、ＥＦＭ信号に基づいてサンプルホールドされて生成され、ＥＦＭ信号に対応して前記双方のフォトディテクタからの出力信号レベルを変化させ、双方のフォトディテクタからの出力信号レベルのオフセットをほぼ同レベルにしているので、前記２つのフォトディテクタから出力される双方の信号のノイズ成分、即ち双方の信号において同相であるＥＦＭ信号成分が相殺され、ウォブル信号におけるノイズ成分が低減或いは除去されると共に、再生されるウォブル信号のレベルをほぼ一定レベルに維持可能となる。

【００２４】また、請求項３では、絶対時間情報に基づいて蛇行して形成されたトラックを有し、該トラックにそってピットが形成された光ディスクからの反射光を少なくとも前記トラックの左右方向に２分割されたフォトディテクタを用いて検出し、該検出結果から前記トラッ

クの蛇行に対応して変化するウォブル信号を再生する光ディスクのウォブル信号再生装置において、前記２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルを制御信号に基づいて変化させて出力する可変増幅回路と、前記２分割されたフォトディテクタの他方のフォトディテクタから出力される信号のレベルと前記可変増幅回路の出力信号のレベルとの差のレベルを有する信号を出力する減算回路と、前記光ディスクからの反射光から得られたＥＦＭ信号に基づいて、前記減算回路の出力信号をサンプルホールドするサンプルホールド回路と、該サンプルホールド回路の出力信号における所定周波数以下の周波数成分のみを前記制御信号として出力する低域フィルタと、前記減算回路の出力信号を入力し、該信号におけるウォブル信号の周波数を含む所定周波数帯域内の周波数の信号を出力する帯域フィルタとを備えた光ディスクのウォブル信号再生装置を提案する。

【００２５】該光ディスクのウォブル信号再生装置によれば、情報の記録再生対象となる光ディスクからの反射光を受光する２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルが、制御信号に基づいて可変増幅回路によって変化され、減算回路によって、前記２分割されたフォトディテクタの他方のフォトディテクタから出力される信号のレベルと前記可変増幅回路の出力信号のレベルとの差のレベルを有する差信号が出力される。また、前記減算回路の出力信号における所定周波数以下の周波数成分、即ちオフセット成分のみが、低域フィルタによって前記制御信号として出力される。ここで、前記低域フィルタから出力される制御信号は、光ディスクからの反射光から得られたＥＦＭ信号に基づいて前記差信号がサンプルホールドされて生成され、ＥＦＭ信号に対応して前記一方のフォトディテクタからの出力信号レベルを変化させる。さらに、前記制御信号は、前記光ディスクからの反射光から得られたＥＦＭ信号が存在するときにのみ前記可変増幅回路から出力される信号と前記他方のフォトディテクタから出力される信号のレベル差に対応したレベルを有する信号となるため、この制御信号によって前記一方のフォトディテクタから出力される信号のレベルを前記他方のフォトディテクタから出力される信号のレベルとほぼ同じになるように制御することによって、前記減算器において双方のノイズ成分が相殺され、前記減算器から出力される信号、即ちウォブル信号におけるノイズ成分が低減或いは除去される。さらに、帯域フィルタによって、前記減算回路の出力信号におけるウォブル信号の周波数を含む所定周波数帯域内の周波数の信号が出力されてウォブル信号が再生される。

【００２６】また、請求項４では、絶対時間情報に基づいて蛇行して形成されたトラックを有し、該トラックにそってピットが形成された光ディスクからの反射光を少なくとも前記トラックの左右方向に２分割されたフォトディテクタを用いて検出し、該検出結果から前記トラックの蛇行に対応して変化するウォブル信号を再生する光ディスクのウォブル信号再生装置において、前記２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルを第１制御信号に基づいて変化させて出力する第１の可変増幅回路と、前記２分割されたフォトディテクタの他方のフォトディテクタから出力される信号のレベルを第２制御信号に基づいて変化させて出力する第２の可変増幅回路と、前記第１の可変増幅器の出力信号レベルと前記第２の可変増幅回路の出力信号レベルとの差のレベルを有する信号を出力する減算回路と、前記光ディスクからの反射光から得られたＥＦＭ信号に基づいて、前記減算回路の出力信号をサンプルホールドするサンプルホールド回路と、該サンプルホールド回路の出力信号における所定周波数以下の周波数成分のみを前記第１制御信号として出力する低域フィルタと、前記第１制御信号を反転して前記第２制御信号として出力する反転回路と、前記サンプルホールド回路の出力信号を入力し、該信号におけるウォブル信号の周波数を含む所定周波数帯域内の周波数の信号を出力する帯域フィルタとを備えた光ディスクのウォブル信号再生装置を提案する。

【００２７】該光ディスクのウォブル信号再生装置によれば、情報の記録再生対象となる光ディスクからの反射光を受光する２分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルが、第１及び第２制御信号に基づいて第１及び第２の可変増幅回路によってそれぞれ変化され、減算回路によって、前記第１及び第２の可変増幅回路の出力信号レベルの差のレベルを有する差信号が出力される。また、前記減算回路の出力信号における所定周波数以下の周波数成分、即ちオフセット成分のみが、低域フィルタによって前記第１制御信号として出力される。ここで、前記低域フィルタから出力される第１制御信号は、光ディスクからの反射光から得られたＥＦＭ信号に基づいて前記差信号がサンプルホールドされて生成され、ＥＦＭ信号に対応して前記一方のフォトディテクタからの出力信号レベルを変化させる。また、前記第２制御信号は反転回路によって前記第１制御信号を反転させることにより生成される。さらに、前記第１及び第２制御信号は、前記光ディスクからの反射光から得られたＥＦＭ信号が存在するときにのみ前記第１及び第２の可変増幅回路から出力される信号レベルの差に対応したレベルを有する信号となるため、この制御信号によって前記双方のフォトディテクタから出力される信号のレベルをほぼ同じになるように制御することによって、前記減算器において双方のノイズ成分が相殺され、前記減算器から出力される信号、即ちウォブル信号におけるノイズ成分が低減或いは除去されると共に、再生されるウォブル信号のレベルをほぼ一定レベル

に維持可能となる。さらに、帯域フィルタによって、前記サンプルホールド回路の出力信号におけるウォブル信号の周波数を含む所定周波数帯域内の周波数の信号が出力されてウォブル信号が再生される。

【００２８】

【発明の実施の形態】以下、図面に基づいて本発明の一実施形態を説明する。図１は本発明の第１の実施形態を示す構成図である。図において、前述した従来例と同一構成部分は同一符号をもって表す。即ち、１０は１ビームプッシュプル法を用いた光ピックアップ、２１，２２は加算増幅器、２３は加算器、２４は減算器、３１は可変増幅回路、３２は減算器、３３は電子スイッチ、３４はローパスフィルタ（ＬＰＦ）、３５はバンドパスフィルタ（ＢＰＦ）、３６はホールドコンデンサである。

【００２９】光ピックアップ１０は、周知の４分割のフォトディテクタ１１を備え、トラックの左側に位置するディテクタ１１ａ、１１ｄの合計受光量及び右側に位置するディテクタ１１ｂ，１１ｃの合計受光量を用いてトラッキング補正を、また対角線上に位置するディテクタ１１ａ、１１ｃの合計受光量及びディテクタ１１ｂ，１１ｄの合計受光量を用いて非点収差法等によりフォーカス補正を行えるものである。

【００３０】加算増幅器２１は光ピックアップ１０のフォトディテクタ１１ａ，１１ｄから出力される電圧を入力してこれらを加算した電圧Ｖ１を出力し、加算増幅器２２は光ピックアップ１０のフォトディテクタ１１ｂ，１１ｃから出力される電圧を入力してこれらを加算した電圧Ｖ２を出力する。

【００３１】また、加算器２３に電圧Ｖ１，Ｖ２が入力され、加算器２３によってこれらが加算されて読出信号（ＲＦ信号）として出力されると共に、電圧Ｖ１，Ｖ２の差の電圧Ｖ３が減算器２４にて生成され、この電圧Ｖ３がトラッキング誤差信号ＴＥとして出力される。

【００３２】さらに、加算増幅器２１から出力された電圧Ｖ１は、結合コンデンサＣ１を介して可変増幅回路３１に入力され、可変増幅回路３１によって、制御電圧Ｖconに基づいて電圧値が所定値に変えられた電圧Ｖ４として減算器３２に入力される。減算器３２の非反転入力端子には電圧Ｖ４が入力され、反転入力端子には結合コンデンサＣ２を介して電圧Ｖ２が入力され、減算器３２はこれらの差を差信号Ｖ５として出力する。この差信号Ｖ５は電子スイッチ３３の第１の接点３３ａに入力されると共にバンドパスフィルタ３５に入力される。

【００３３】電子スイッチ３３の第２の接点３３ｂは開放され、接片３３ｃはローパスフィルタ３４の入力端子に接続されると共にホールドコンデンサ３６を介して接地されている。また、電子スイッチ３３は、ＲＦ信号から再生されたＥＦＭ信号によって切り替えられ、ＥＦＭ信号がハイレベルのとき接片３３ｃは第１の接点３３ａに接続され、ローレベルのとき接片３３ｃは第２の接点３３ｂに接続される。

【００３４】ここで、電子スイッチ３３とホールドコンデンサ３６によってサンプルホールド回路が構成される。

【００３５】差信号Ｖ５は、電子スイッチ３３を介してローパスフィルタ４２に入力されると、ローパスフィルタ３４によって差信号Ｖ５から所定の周波数、例えば４０ＫＨｚ以下の周波数成分のみが抽出されて、前述した制御電圧Vconとして出力される。

【００３６】一方、バンドパスフィルタ３５に入力された差信号Ｖ５は、バンドパスフィルタ３５によって所定の周波数帯域内の周波数成分、即ちウォブル信号の周波数２２．０５ＫＨｚを中心とする所定周波数帯域内の周波数成分のみが抽出され、これがウォブル信号ＷＢとして出力される。

【００３７】次に、前述の構成よりなる本実施形態の動作を図４の信号波形図に基づいて説明する。光ディスク上の情報が記録されている、即ちピットが形成されているトラックを再生するとそのＲＦ信号はＥＦＭ信号によって変調されたものとなる。従って、ＲＦ信号からＥＦＭ信号を再生することができる。

【００３８】しかし、ウォブル信号の再生に必要とする電圧Ｖ１，Ｖ２もＥＦＭ信号が混入したものとなると共に、電圧Ｖ１，Ｖ２のレベルは違ったものとなっている。ここで、本実施形態ではこれらの電圧Ｖ１，Ｖ２に混入するＥＦＭ信号成分をが等しくなるように、可変増幅回路３１によって電圧Ｖ１のレベルを補正した電圧Ｖ４を生成し、さらにこの電圧Ｖ４と電圧Ｖ２との差信号Ｖ５を減算器３２によって生成することにより、ＥＦＭ成分の混入しない電圧Ｖ５を得て、この電圧Ｖ５からウォブル信号を再生している。

【００３９】可変増幅器３１における電圧Ｖ１の補正に当たっては、ＥＦＭ信号がハイレベルＨのときにのみ差信号Ｖ５をローパスフィルタ３４に入力し、ローパスフィルタ３４によって差信号Ｖ５の包絡線成分、即ちＥＦＭ信号成分を抽出し、これを制御電圧Vconとして電圧Ｖ１を補正している。

【００４０】従って、図４に示すように電圧Ｖ４のレベルは電圧Ｖ２のレベルとほぼ同レベルとされるので、電圧Ｖ４のノイズ成分及びＥＦＭ信号成分と電圧Ｖ２のノイズ成分及びＥＦＭ信号成分とが相殺され、ノイズ成分及びＥＦＭ信号成分が低減或いは除去されたウォブル信号ＷＢが生成される。

【００４１】ここで、図４に示す信号波形では制御電圧Vconがプラスなので可変増幅回路３１はゲインを下げる方向に動作し、また電圧Ｖ４が電圧Ｖ２よりも小さいときは制御電圧Vconはマイナスとなるため、可変増幅回路３１はゲインを上げる方向に動作する。

【００４２】前述したように本実施形態によれば、簡単な構成によって常に正確なウォブル信号ＷＢを再生でき

るので、スピンドル制御、特にトラッキングオフ時のスピンドル制御を安定して行うことができる。さらに、光ディスクに偏芯或いはスキュー（ＳＫＥＷ）が生じていてもＡＩＴＰデータを正確に再生することができるので、サーチミスを大幅に低減することができる。さらに、光ピックアップの経年変化や光ディスクメディアの特性が変化しても、常にＣ／Ｎの最良点に自動的にサーボをかけることができる。

【００４３】次に、本発明の第２の実施形態を説明する。図５は本発明の第２の実施形態を示す構成図である。図において、前述した従来例と同一構成部分は同一符号をもって表す。即ち、１０は１ビームアッシュプル法を用いた光ピックアップ、２１，２２は加算増幅器、２３は加算器、２４は減算器、４１Ａ，４１Ｂは可変増幅回路、４２は減算器、４３は電子スイッチ、４４はホールドコンデンサ、４５は差動増幅器、４６はローパスフィルタ（ＬＰＦ）、４７は反転増幅器、４８はバンドパスフィルタ（ＢＰＦ）である。

【００４４】光ピックアップ１０は、周知の４分割のフォトディテクタ１１を備え、トラックの左側に位置するディテクタ１１ａ、１１ｄの合計受光量及び右側に位置するディテクタ１１ｂ，１１ｃの合計受光量を用いてトラッキング補正を、また対角線上に位置するディテクタ１１ａ、１１ｃの合計受光量及びディテクタ１１ｂ，１１ｄの合計受光量を用いて非点収差法等によりフォーカス補正を行えるものである。

【００４５】加算増幅器２１は光ピックアップ１０のフォトディテクタ１１ａ，１１ｄから出力される電圧を入力してこれらを加算した電圧Ｖ１を出力し、加算増幅器２２は光ピックアップ１０のフォトディテクタ１１ｂ，１１ｃから出力される電圧を入力してこれらを加算した電圧Ｖ２を出力する。

【００４６】また、加算器２３に電圧Ｖ１，Ｖ２が入力され、加算器２３によってこれらが加算されて読出信号（ＲＦ信号）として出力されると共に、電圧Ｖ１，Ｖ２の差の電圧Ｖ３が減算器２４にて生成され、この電圧Ｖ３がトラッキング誤差信号ＴＥとして出力される。

【００４７】さらに、加算増幅器２１から出力された電圧Ｖ１は、結合コンデンサＣ１を介して可変増幅回路４１Ａに入力され、可変増幅回路４１Ａによって、制御電圧Vcon1に基づいて電圧値が所定値に変えられた電圧Ｖａとして減算器４２の非反転入力端子に入力される。

【００４８】また、加算器２２から出力された電圧Ｖ２は、結合コンデンサＣ２を介して可変増幅器４１Ｂに入力され、可変増幅器４１Ｂによって、制御電圧Vcon2に基づいて電圧値が所定値に変えられた電圧Ｖｂとして減算器４２の反転入力端子に入力される。

【００４９】減算器４２は入力された電圧Ｖａ，Ｖｂの差を差信号Ｖｃとして出力する。この差信号Ｖｃは電子スイッチ４３の第１の接点４３ａ及びバンドパスフィルタ４８の入力端子に入力される。

【００５０】電子スイッチ４３の第２の接点４３ｂは開放され、接片４３ｃは差動増幅器４５の非反転入力端子に接続されると共にホールドコンデンサ４４を介して接地されている。また、電子スイッチ４３は、ＲＦ信号から再生されたＥＦＭ信号によって切り替えられ、ＥＦＭ信号がハイレベルのとき接片４３ｃは第１の接点４３ａに接続され、ローレベルのとき接片４３ｃは第２の接点４３ｂに接続される。

【００５１】また、差動増幅器４５の出力端子はその反転入力端子に接続されると共にローパスフィルタ４６の入力端子に接続されている。

【００５２】ここで、電子スイッチ４３とホールドコンデンサ４４及び差動増幅器４５によってサンプルホールド回路が構成される。

【００５３】差動増幅器４５から出力されるホールド信号Ｖｄは、ローパスフィルタ４６に入力されると、ローパスフィルタ４６によってホールド信号Ｖｄから所定の周波数、例えば４０ＫＨｚ以下の周波数成分のみが抽出されて、前述した制御電圧Vcon1として出力される。

【００５４】さらに、制御電圧Vcon1は反転増幅回路４７によってその正負が反転されて制御電圧Vcon2として出力される。

【００５５】一方、バンドパスフィルタ４８に入力された差信号Ｖｃは、バンドパスフィルタ４８によって所定の周波数帯域内の周波数成分、即ちウォブル信号の周波数２２．０５ＫＨｚを中心とする所定周波数帯域内の周波数成分のみが抽出され、これがウォブル信号ＷＢとして出力される。

【００５６】前述の構成よりなる第２の実施形態によれば、光ディスク上の情報が記録されている、即ちピットが形成されているトラックを再生するとそのＲＦ信号はＥＦＭ信号によって変調されたものとなる。従って、ＲＦ信号からＥＦＭ信号を再生することができる。

【００５７】しかし、ウォブル信号の再生に必要とする電圧Ｖ１，Ｖ２もＥＦＭ信号が混入したものとなると共に、電圧Ｖ１，Ｖ２のレベルは違ったものとなっている。

【００５８】ここで、本実施形態ではこれらの電圧Ｖ１，Ｖ２に混入するＥＦＭ信号成分が等しくなり且つ所定値以上の電圧レベルが得られるように、可変増幅回路４１Ａ，４１Ｂによって電圧Ｖ１，Ｖ２のレベルを補正した電圧Ｖａ，Ｖｂを生成し、さらにこの電圧Ｖａ，Ｖｂの差信号Ｖｃを減算器４２によって生成することにより、ＥＦＭ成分の混入しないホールド信号Ｖｄを得て、このホールド信号Ｖｄからウォブル信号を再生している。

【００５９】可変増幅器４１Ａ，４１Ｂにおける電圧Ｖ１，Ｖ２の補正に当たっては、ＥＦＭ信号がハイレベルＨのときにのみ差信号Ｖｃをサンプルホールドし、ロー

バスフィルタ46によってホールド信号Vdの包絡線成分、即ちEFM信号成分を抽出し、これを制御電圧Vcon1として電圧V1を補正している。さらに、制御電圧Vcon1を反転して制御電圧Vcon2を得て、これにより電圧V2を補正することにより、可変増幅回路41A，41Bをプッシュプル動作させている。これにより、常に最適な一定レベルでウォブル信号を再生できるようにしている。

【0060】従って、電圧Vaのレベルは電圧Vbのレベルとほぼ同レベルとされるので、電圧Vaのノイズ成分及びEFM信号成分と電圧Vbのノイズ成分及びEFM信号成分とが相殺され、ノイズ成分及びEFM信号成分が低減或いは除去されたウォブル信号WBが生成される。

【0061】前述したように本実施形態によれば、簡単な構成によって常に正確な且つ最適なレベルのウォブル信号WBを再生できるので、スピンドル制御、特にトラッキングオフ時のスピンドル制御を安定して行うことができる。さらに、光ディスクに偏芯或いはスキュー（SKEW）が生じていてもATIPデータを正確に再生することができるので、サーチミスを大幅に低減することができる。さらに、光ピックアップの経年変化や光ディスクメディアの特性が変化しても、常にC／Nの最良点に自動的にサーボをかけることができる。

【0062】尚、前述した第1及び第2の実施形態における構成は一例であり、本願発明がこれに限定されないことは言うまでもないことである。

【0063】

【発明の効果】以上説明したように本発明の請求項1記載の光ディスクのウォブル信号再生方法によれば、EFM信号に同期して、2つのフォトディテクタから出力される双方の信号のノイズ成分、即ちEFM信号成分が相殺され、ウォブル信号におけるノイズ成分が低減或いは除去されるので、常に正確なウォブル信号を再生でき、スピンドル制御、特にトラッキングオフ時のスピンドル制御を安定して行うことができると共に、光ディスクに偏芯或いはSKEWが生じていてもATIPデータを正確に再生することができ、サーチミスを大幅に低減することができる。さらに、光ピックアップの経年変化や光ディスクメディアの特性が変化しても、常にC／Nの最良点に自動的にサーボをかけることができる。

【0064】また、請求項2記載の光ディスクのウォブル信号再生方法によれば、EFM信号に同期して、2つのフォトディテクタから出力される双方の信号のノイズ成分、即ちEFM信号成分が相殺され、ウォブル信号におけるノイズ成分が低減或いは除去されるので、常に正確な最適レベルのウォブル信号を再生でき、スピンドル制御、特にトラッキングオフ時のスピンドル制御を安定して行うことができると共に、光ディスクに偏芯或いはSKEWが生じていてもATIPデータを正確に再生することができ、サーチミスを大幅に低減することができる。さらに、光ピックアップの経年変化や光ディスクメディアの特性が変化しても、常にC／Nの最良点に自動的にサーボをかけることができる。

【0065】また、請求項3記載の光ディスクのウォブル信号再生装置によれば、簡単な構成によってEFM信号に同期して、ウォブル信号のオフセット成分、即ちEFM信号成分が制御信号とされ、該制御信号によってトラックの左右方向に2分割されたフォトディテクタの一方のフォトディテクタから出力される信号のレベルを他方のフォトディテクタから出力される信号のレベルとほぼ同じになるように制御し、減算器によって双方の信号に重畳しているノイズ成分を相殺しているので、ウォブル信号におけるノイズ成分を低減或いは除去することができる。これにより、常に正確なウォブル信号を再生できるので、スピンドル制御、特にトラッキングオフ時のスピンドル制御を安定して行うことができる。さらに、光ディスクに偏芯或いはSKEWが生じていてもATIPデータを正確に再生することができるので、サーチミスを大幅に低減することができる。さらに、光ピックアップの経年変化や光ディスクメディアの特性が変化しても、常にC／Nの最良点に自動的にサーボをかけることができる。

【0066】また、請求項4記載の光ディスクのウォブル信号再生装置によれば、簡単な構成によってEFM信号に同期して、ウォブル信号のオフセット成分、即ちEFM信号成分が制御信号とされ、該制御信号によってトラックの左右方向に2分割されたフォトディテクタの双方のフォトディテクタから出力される信号のレベルをほぼ同じになるように制御し、減算器によって双方の信号に重畳しているノイズ成分を相殺しているので、ウォブル信号におけるノイズ成分を低減或いは除去することができる。これにより、常に正確な最適レベルのウォブル信号を再生できるので、スピンドル制御、特にトラッキングオフ時のスピンドル制御を安定して行うことができる。さらに、光ディスクに偏芯或いはSKEWが生じていてもATIPデータを正確に再生することができるので、サーチミスを大幅に低減することができる。さらに、光ピックアップの経年変化や光ディスクメディアの特性が変化しても、常にC／Nの最良点に自動的にサーボをかけることができるという非常に優れた効果を奏するものである。

【図面の簡単な説明】

【図1】本発明の第1の実施形態を示す構成図

【図2】光ディスクに形成されているトラックを説明する図

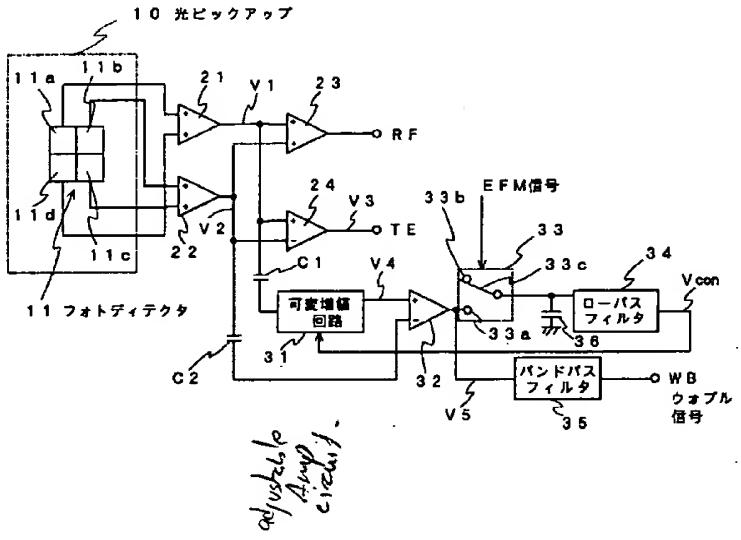
【図3】従来例を示す構成図

【図4】本発明の第1の実施形態の動作を説明する信号波形図

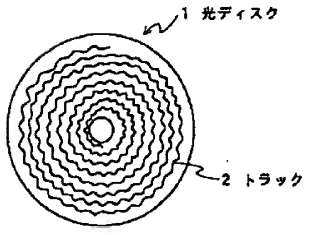
【図5】本発明の第2の実施形態を示す構成図

【符号の説明】
10…光ピックアップ、11a～11d…フォトディテクタ、21，22…加算増幅器、23…加算器、24…減算器、31…可変増幅回路、32…減算器、33…電子スイッチ、34…ローパスフィルタ、35…バンドパスフィルタ、41A，41B…可変増幅器、42…減算器、43…電子スイッチ、44…ホールドコンデンサ、45…差動増幅器、46…ローパスフィルタ、47…反転増幅器、48…バンドパスフィルタ。

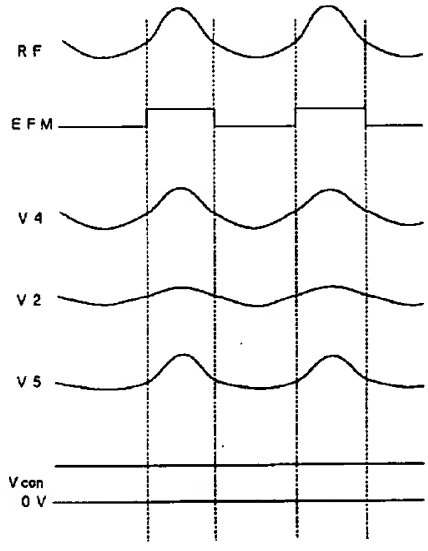
【図1】



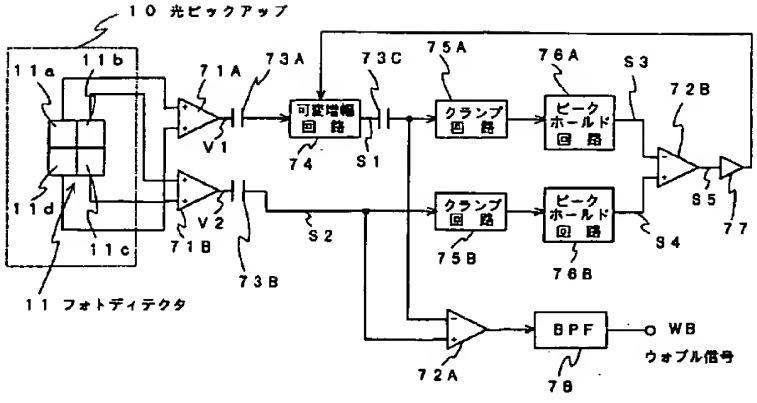

【図2】



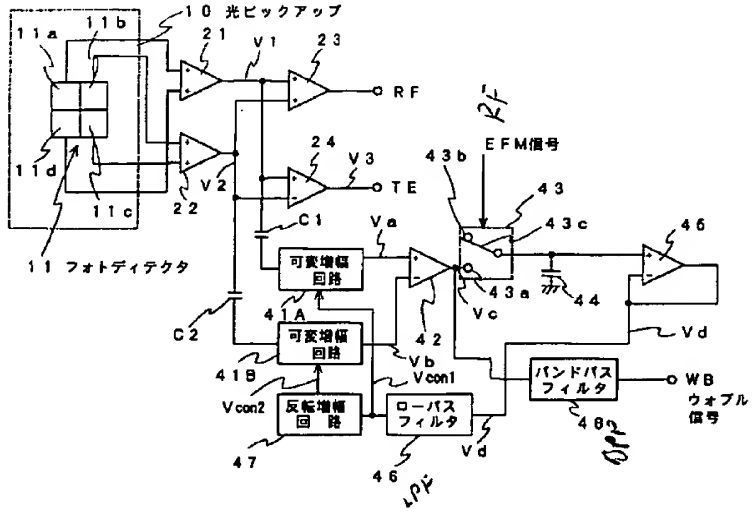

【図4】



【図3】


10 光ピックアップ
11a
11b
11c
11d
11 フォトディテクタ
71A
71B
V1
V2
73A
73B
73C
74
S1
S2
可変増幅回路
75A
75B
クランプ回路
76A
76B
ピークホールド回路
S3
S4
S5
72A
72B
77
BPF
78
WB
ウォブル信号

【図5】


10 光ピックアップ
11a
11b
11c
11d
11 フォトディテクタ
21
22
23
V1
V2
V3
RF
TE
24
C1
C2
Va
Vb
Vc
Vd
41A
41B
可変増幅回路
Vcon1
Vcon2
反転増幅回路
42
43
43a
43b
43c
EFM信号
44
46
ローパスフィルタ
47
バンドパスフィルタ
48
WB
ウォブル信号

(1)

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CLAIMS

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[Claim(s)]
[Claim 1] The reflected light from the optical disk with which it has the truck moved in a zigzag direction and formed based on absolute time information, there was along this truck, and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration approach of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on a control signal. The difference signal which has the level of a difference with the level of this signal by which level change was carried out, and the signal outputted from the photodetector of another side is generated. After carrying out sample hold of said difference signal based on the EFM signal acquired from said reflected light, The wobble signal regeneration approach of the optical disk characterized by reproducing said control signal, and nothing and said difference signal for this sample hold signal as a wobble signal through a band-pass filter through a low-pass filter.
[Claim 2] The reflected light from the optical disk with which it has the truck moved in a zigzag direction and formed based on absolute time information, there was along this truck, and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration approach of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The level of the signal outputted from the photodetector of both said photodetectors carried out 2 ****s is changed based on the 1st control signal and the 2nd control signal, respectively. The difference signal which has the level of the difference of this signal level by which level change was carried out is generated. After carrying out sample hold of said difference signal based on the EFM signal acquired from said reflected light, while making this sample hold signal with said 1st control signal through a low-pass filter The wobble signal regeneration approach of the optical disk characterized by reversing this 1st control signal and reproducing said 2nd control signal, and nothing and said sample hold signal as a wobble signal through a band-pass filter.
[Claim 3] The reflected light from the optical disk with which it has the truck moved in a zigzag direction and formed based on absolute time information, there was along this truck, and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration equipment of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The adjustable amplifying circuit which the level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on a control signal, and outputs it, The subtractor circuit which outputs the signal which has the level of the difference of the level of the signal outputted from the photodetector of another side of said photodetector carried out 2 ****s, and the level of the output signal of said adjustable amplifying circuit, The sample hold circuit which carries out sample hold of the output signal of said subtractor circuit based on the EFM signal acquired from the reflected light from said optical disk, The low-pass filter which outputs only the frequency component below the predetermined frequency in the output signal of this sample hold circuit as said control signal, Wobble signal regeneration equipment of the optical disk characterized by having the band-pass filter which outputs the signal of the frequency in the predetermined frequency band which inputs the output signal of said subtractor circuit and contains the frequency of the wobble signal in this signal.

[Claim 4] The reflected light from the optical disk with which it has the truck moved in a zigzag direction and formed based on absolute time information, there was along this truck, and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration equipment of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The 1st adjustable amplifying circuit which the level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on the 1st control signal, and outputs it, The 2nd adjustable amplifying circuit which the level of the signal outputted from the photodetector of another side of said photodetector carried out 2 ****s is changed based on the 2nd control signal, and outputs it, The subtractor circuit which outputs the signal which has the level of the difference of the output-signal level of said 1st adjustable amplifier, and the output-signal level of said 2nd adjustable amplifying circuit, The sample hold circuit which carries out sample hold of the output signal of said subtractor circuit based on the EFM signal acquired from the reflected light from said optical disk, The low-pass filter which outputs only the frequency component below the predetermined frequency in the output signal of this sample hold circuit as said 1st control signal, The inverter circuit which reverses said 1st control signal and is outputted as said 2nd control signal, Wobble signal regeneration equipment of the optical disk characterized by having the band-pass filter which outputs the signal of the frequency in the predetermined frequency band which inputs the output signal of said sample hold circuit, and contains the frequency of the wobble signal in this signal.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the wobble signal regeneration approach used for the information record regenerative apparatus of an optical disk, and its equipment.
[0002]
[Description of the Prior Art] As conventionally shown in the recordable optical disk 1 of a write once optical disk (CD-WO) etc. at drawing 2 , the truck 2 which winds with few amplitude beforehand (it moves in a zigzag direction) is formed in the record section in the shape of a spiral. The wave of this truck is ATIP (Absolute Time In Pregroove). The absolute time information called data is expressed, 22.05kHz is made into fundamental frequency, and the FSK (Frequency Shift Keying) modulation of that frequency is carried out so that **1kHz may change according to whether the contents of the bit, i.e., this bit, are "1", or it is "0" to every [ corresponding to 1 bit of ATIP data ] die length (seven periods with a frequency of 44.1kHz).
[0003] Moreover, ATIP data consist of frames which a large number which consist of a bit string to which one frame equipped the position with the frame alignment signal of a fixed pattern, including the bit of one constant (84 bits) followed, and each frame is repeated with the period with a frequency of 75Hz.
[0004] On the other hand, when recording information, such as voice and an image, on the recordable optical disk mentioned above, the control information showing the number of channels of music, the existence of pre-emphasis, the number of music, the time amount from the beginning of music, the absolute time from the disk most inner circumference, etc., i.e., sub-code data, is recorded on coincidence. This sub-code data consists of many frames which consist of a bit string to which one frame equipped the position with the frame alignment signal of a fixed pattern, including the bit (however, the unit length corresponding to 1 bit differing from a case with ATIP data) of fixed numbers (98 bits), and each frame is recorded with a period with a frequency of 75Hz.
[0005] Here, to actually record information on an optical disk, since it is defined by specification that frame synchronization of ATIP data and the sub-code data must be carried out, and they must be recorded, it needs to reproduce ATIP data. For this reason, when reproducing ATIP data conventionally, it reproduced as an analog signal (wobble signal) which detects the wave mentioned above and has the period of a wave, and was getting over by the FSK demodulator circuit using an analog PLL circuit etc.
[0006] However, there were the following troubles in playback of a wobble signal.
[0007] That is, a tracking error signal takes the difference of right and left of return light reflected from the optical disk on the photodetector of an optical pickup. Therefore, when an objective lens followed and moves to the eccentricity of an optical disk, naturally the spot of return light moves to right and left also on the photodetector in an optical pickup. Here, although a noise is not overlapped on a tracking error signal if considering the case where a noise is in return light all the incident light reinforcement to each photodetector is these level, when the level of incident light reinforcement on either side differs, a noise and an EFM signal component will be overlapped on a tracking error signal, and C/N of the wobble signal WB will be reduced.
[0008] for example, to the optical disk of a postscript mold which was mentioned above When a wobble signal is reproduced in the field where information was recorded, and the field to which a non-recorded field exists and information is recorded, If eccentricity etc. is in an optical disk, it will be overlapped on

a wobble signal, the signal component, i.e., the EFM signal component, of recording information, and C/N will be reduced, ATIP data will not be able to be reproduced correctly, but big trouble will be caused to a search, and a malfunction will be caused. (4)
[0009] In order to reduce such a malfunction, by the 1 beam push pull method, the wobble signal was reproduced by circuitry which is indicated by JP,6-44568,A.
[0010] That is, wobble signal regeneration equipment consists of Adders 71A and 71B, Subtractors 72A and 72B, coupling capacitors 73A-73C, the adjustable amplifying circuit 74, clamping circuits 75A and 75B, peak hold circuits 76A and 76B, an amplifying circuit 77, and a band pass filter (BPF) 78, as shown in drawing 3 .
[0011] Moreover, 10 is an optical pickup and the photodetector 11 of well-known quadrisection is used as a photodetector 11 which receives the reflected light from an optical disk. Moreover, the electrical potential differences V1 and V2 corresponding to the sum total light income of the detectors 11b and 11c located in detectors [ which are located in the left-hand side of a truck / 11a and 11d ] sum total light income and right-hand side are generated by summing amplifiers 71A and 71B.
[0012] Here, in electrical potential differences V1 and V2, when the quantity of light of the reflected light beam from an optical disk changes according to a pit in the predetermined range and a groove changes to radial [ of a light beam ], where bias only of the predetermined level is carried out, according to a pit, it changes a period with short signal level, and the whole signal level is further changed according to a groove.
[0013] On the other hand, an electrical potential difference V1 is inputted into the adjustable amplifying circuit 74 through coupling-capacitor 73A, and the electrical potential difference V2 is inputted into the non-inversed input terminal of clamping circuit 75B and subtraction machine 72A as a signal S2 through coupling-capacitor 73B.
[0014] Moreover, the output signal S1 from the adjustable amplifying circuit 74 is inputted into the inversed input terminal of clamping circuit 75A and subtraction machine 72A through coupling-capacitor 73C.
[0015] The output signal of clamping circuit 75A is inputted into the inversed input terminal of subtraction machine 72B as a signal S3 through peak hold circuit 76A, and the output signal of clamping circuit 75B is inputted into the non-inversed input terminal of subtraction machine 72B as signal S4 through peak hold circuit 76B. Furthermore, after the output signal S5 of subtraction machine 72B is amplified by amplifier 77, it is inputted into the adjustable amplifying circuit 74 as a control signal.
[0016] Moreover, the wobble signal WB is reproduced by letting the output signal of subtraction machine 72A pass to a band pass filter 78.
[0017] According to the above-mentioned configuration, the signal level of RF component which changes according to a pit is between an input signal S1 and S2, and after amending the signal level of an input signal S1 so that it may become equal, since these difference signals are generated and it is reproducing as a wobble signal WB, even when the incidence location of the reflected light beam to the optical pickup 10 changes by secular change etc., mixing of RF component to the wobble signal WB can be reduced.
[0018]
[Problem(s) to be Solved by the Invention] However, it had the trouble of components mark having increased and becoming cost quantity while the conventional wobble signal regeneration equipment mentioned above had the complicated configuration.
[0019] The purpose of this invention is to offer the wobble signal regeneration approach of the optical disk which can reproduce an always exact wobble signal by the easy configuration, and its equipment in view of the above-mentioned trouble.
[0020]
[Means for Solving the Problem] This invention in order to attain the above-mentioned purpose in claim 1 The reflected light from the optical disk with which it has the truck moved in a zigzag direction and formed based on absolute time information, there was along this truck, and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration approach of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on a control signal. The difference signal which has the level of a difference with the level of this signal by

which level change was carried out, and the signal outputted from the photodetector of another side is generated. After carrying out sample hold of said difference signal based on the EFM signal acquired from said reflected light, The wobble signal regeneration approach of the optical disk which reproduces said control signal, and nothing and said difference signal for this sample hold signal as a wobble signal through a band-pass filter through a low-pass filter is proposed.

[0021] As for the level of the signal outputted from one photodetector of the photodetector which receives the reflected light from the optical disk set as the informational record playback object, and which was carried out 2 ****s, according to the wobble signal regeneration approach of this optical disk, the level changes with control signals. Furthermore, the difference signal which has the level of the difference of the level of this signal by which level change was carried out, and the level of the signal outputted from the photodetector of another side is generated, and a wobble signal is reproduced by letting a band-pass filter pass in this difference signal. Based on the EFM signal with which said control signal was acquired from the reflected light from an optical disk, sample hold of said difference signal is carried out here. Since it is furthermore generated through a low-pass filter, the output-signal level from one [ said ] photodetector is changed corresponding to an EFM signal and offset of the output-signal level from both photodetectors is mostly made into this level An EFM signal component in phase is offset in the noise component of both signals outputted from said two photodetectors, i.e., both signals, and the noise component in a wobble signal is reduced or removed.

[0022] Moreover, it has the truck moved in a zigzag direction and formed in claim 2 based on absolute time information. The reflected light from the optical disk with which there was it along this truck and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration approach of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The level of the signal outputted from the photodetector of both said photodetectors carried out 2 ****s is changed based on the 1st control signal and the 2nd control signal, respectively. The difference signal which has the level of the difference of this signal level by which level change was carried out is generated. After carrying out sample hold of said difference signal based on the EFM signal acquired from said reflected light, while making this sample hold signal with said 1st control signal through a low-pass filter The wobble signal regeneration approach of the optical disk which reverses this 1st control signal and reproduces said 2nd control signal, and nothing and said sample hold signal as a wobble signal through a band-pass filter is proposed.

[0023] As for the level of the signal outputted from the photodetector of the both sides of the photodetector which receives the reflected light from the optical disk set as the informational record playback object, and which was carried out 2 ****s, according to the wobble signal regeneration approach of this optical disk, the level changes with the 1st and 2nd control signals. Moreover, the difference signal which has the level of the difference of this signal level by which level change was carried out is generated, sample hold is carried out based on the EFM signal which was able to acquire this difference signal from the reflected light from an optical disk, and a wobble signal is further reproduced by letting a band-pass filter pass in this signal that carried out sample hold. Moreover, said 1st control signal is generated by letting a low-pass filter pass in said signal by which sample hold was carried out, and said 2nd control signal is generated by reversing said 1st control signal. Based on an EFM signal, sample hold of said 1st and 2nd control signals is carried out, and they are generated here. Since the output-signal level from the photodetector of said both sides is changed corresponding to an EFM signal and offset of the output-signal level from both photodetectors is mostly made into this level While an EFM signal component in phase is offset in the noise component of both signals outputted from said two photodetectors, i.e., both signals, and the noise component in a wobble signal is reduced or removed Maintenance on fixed level is almost attained in the level of the wobble signal reproduced.

[0024] Moreover, it has the truck moved in a zigzag direction and formed in claim 3 based on absolute time information. The reflected light from the optical disk with which there was it along this truck and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration equipment of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The adjustable amplifying circuit which the level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on a control signal, and outputs it, The subtractor circuit which outputs the signal which has the level of the difference of the level of the signal outputted

from the photodetector of another side of said photodetector carried out 2 ****s, and the level of the output signal of said adjustable amplifying circuit, The sample hold circuit which carries out sample hold of the output signal of said subtractor circuit based on the EFM signal acquired from the reflected light from said optical disk, The low-pass filter which outputs only the frequency component below the predetermined frequency in the output signal of this sample hold circuit as said control signal, The output signal of said subtractor circuit is inputted and the wobble signal regeneration equipment of the optical disk equipped with the band-pass filter which outputs the signal of the frequency in the predetermined frequency band containing the frequency of the wobble signal in this signal is proposed.

[0025] According to the wobble signal regeneration equipment of this optical disk, the level of the signal outputted from one photodetector of the photodetector which receives the reflected light from the optical disk set as the informational record playback object, and which was carried out 2 ****s It changes with adjustable amplifying circuits based on a control signal, and the difference signal which has the level of the difference of the level of the signal outputted by the subtractor circuit from the photodetector of another side of said photodetector carried out 2 ****s and the level of the output signal of said adjustable amplifying circuit is outputted. Moreover, it is outputted as said control signal with a low-pass filter, the frequency component, i.e., the offset component, below the predetermined frequency in the output signal of said subtractor circuit. Here, based on the EFM signal acquired from the reflected light from an optical disk, sample hold of said difference signal is carried out, it is generated, and the control signal outputted from said low-pass filter changes the output signal level from one [ said ] photodetector corresponding to an EFM signal. Furthermore, since said control signal turns into a signal outputted from said adjustable amplifying circuit, and a signal which has the level corresponding to the level difference of the signal outputted from the photodetector of said another side only when the EFM signal acquired from the reflected light from said optical disk exists, By controlling the level of the signal outputted from one [ said ] photodetector by this control signal to become almost the same as the level of the signal outputted from the photodetector of said another side Both noise components are offset in said subtractor, and the noise component in the signal outputted from said subtractor, i.e., a wobble signal, is reduced or removed. Furthermore, with a band-pass filter, the signal of the frequency in the predetermined frequency band containing the frequency of the wobble signal in the output signal of said subtractor circuit is outputted, and a wobble signal is reproduced.

[0026] Moreover, it has the truck moved in a zigzag direction and formed in claim 4 based on absolute time information. The reflected light from the optical disk with which there was it along this truck and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration equipment of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The 1st adjustable amplifying circuit which the level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on the 1st control signal, and outputs it, The 2nd adjustable amplifying circuit which the level of the signal outputted from the photodetector of another side of said photodetector carried out 2 ****s is changed based on the 2nd control signal, and outputs it, The subtractor circuit which outputs the signal which has the level of the difference of the output-signal level of said 1st adjustable amplifier, and the output-signal level of said 2nd adjustable amplifying circuit, The sample hold circuit which carries out sample hold of the output signal of said subtractor circuit based on the EFM signal acquired from the reflected light from said optical disk, The low-pass filter which outputs only the frequency component below the predetermined frequency in the output signal of this sample hold circuit as said 1st control signal, The inverter circuit which reverses said 1st control signal and is outputted as said 2nd control signal, The output signal of said sample hold circuit is inputted, and the wobble signal regeneration equipment of the optical disk equipped with the band-pass filter which outputs the signal of the frequency in the predetermined frequency band containing the frequency of the wobble signal in this signal is proposed.

[0027] According to the wobble signal regeneration equipment of this optical disk, the level of the signal outputted from one photodetector of the photodetector which receives the reflected light from the optical disk set as the informational record playback object, and which was carried out 2 ****s changes with the 1st and 2nd adjustable amplifying circuits based on the 1st and 2nd control signals, respectively, and the difference signal which has the level of the difference of the output signal level of said 1st and 2nd adjustable amplifying circuits is outputted by the subtractor circuit. Moreover, it is outputted as said 1st control signal with a low-pass filter, the frequency component, i.e., the offset component, below the

predetermined frequency in the output signal of said subtractor circuit. Here, based on the EFM signal acquired from the reflected light from an optical disk, sample hold of said difference signal is carried out, it is generated, and the 1st control signal outputted from said low-pass filter changes the output signal level from one [ said ] photodetector corresponding to an EFM signal. Moreover, said 2nd control signal is generated by reversing said 1st control signal by the inverter circuit. Furthermore, since said 1st and 2nd control signals turn into a signal which has the level corresponding to the difference of the signal level outputted from said 1st and 2nd adjustable amplifying circuits only when the EFM signal acquired from the reflected light from said optical disk exists, By controlling the level of the signal outputted from the photodetector of said both sides by this control signal to become almost the same Both noise components are offset in said subtractor, and while the noise component in the signal outputted from said subtractor, i.e., a wobble signal, is reduced or removed, maintenance on fixed level is almost attained in the level of the wobble signal reproduced. Furthermore, with a band-pass filter, the signal of the frequency in the predetermined frequency band containing the frequency of the wobble signal in the output signal of said sample hold circuit is outputted, and a wobble signal is reproduced.
[0028]
[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained based on a drawing. Drawing 1 is the block diagram showing the 1st operation gestalt of this invention. In drawing, the same component as the conventional example mentioned above is expressed with the same sign. the optical pickup for which 10 used the 1 beam push pull method, and 21 and 22 -- a summing amplifier and 23 -- an adder and 24 -- for a subtractor and 33, as for a low pass filter (LPF) and 35, an electronic switch and 34 are [ a subtractor and 31 / an adjustable amplifying circuit and 32 / a band pass filter (BPF) and 36 ] hold capacitors. [ namely, ]
[0029] An optical pickup 10 is equipped with the photodetector 11 of well-known quadrisection, and can perform focal amendment by an astigmatism method etc. using the sum total light income of the detectors 11a and 11c located on the diagonal line in tracking amendment again using the sum total light income of the detectors 11b and 11c located in detectors [ which are located in the left-hand side of a truck / 11a and 11d ] sum total light income and right-hand side, and Detectors [ 11b and 11d ] sum total light income.
[0030] A summing amplifier 21 outputs the electrical potential difference V1 which inputted the electrical potential difference outputted from the photodetectors 11a and 11d of an optical pickup 10, and added these, and outputs the electrical potential difference V2 which the summing amplifier 22 inputted the electrical potential difference outputted from the photodetectors 11b and 11c of an optical pickup 10, and added these.
[0031] Moreover, electrical potential differences V1 and V2 are inputted into an adder 23, while these are added and being outputted as a read-out signal (RF signal) by the adder 23, the electrical potential difference V3 of the difference of electrical potential differences V1 and V2 is generated by the subtractor 24, and this electrical potential difference V3 is outputted as a tracking error signal TE.
[0032] Furthermore, the electrical potential difference V1 outputted from the summing amplifier 21 is inputted into the adjustable amplifying circuit 31 through a coupling capacitor C1, and is inputted into a subtractor 32 as an electrical potential difference V4 on which the electrical-potential-difference value was changed into the predetermined value by the adjustable amplifying circuit 31 based on control voltage Vcon. An electrical potential difference V4 is inputted into the non-inversed input terminal of a subtractor 32, an electrical potential difference V2 is inputted into an inversed input terminal through a coupling capacitor C2, and a subtractor 32 outputs these differences as a difference signal V5. This difference signal V5 is inputted into a band pass filter 35 while it is inputted into 1st contact 33a of an electronic switch 33.
[0033] 2nd contact 33b of an electronic switch 33 is opened wide, and contact piece 33c is grounded through the hold capacitor 36 while connecting with the input terminal of a low pass filter 34. Moreover, an electronic switch 33 is changed by the EFM signal reproduced from the RF signal, when an EFM signal is high-level, contact piece 33c is connected to 1st contact 33a, and contact piece 33c is connected to 2nd contact 33b at the time of a low level.
[0034] Here, a sample hold circuit is constituted by an electronic switch 33 and the hold capacitor 36.
[0035] A predetermined frequency, for example, a frequency component 40kHz or less, will be extracted from the difference signal V5 by the low pass filter 34, and the difference signal V5 will be outputted as control voltage Vcon mentioned above, if inputted into a low pass filter 42 through an

electronic switch 33.
[0036] On the other hand, the frequency component in a predetermined frequency band, i.e., the frequency component in the predetermined frequency band centering on the frequency of 22.05kHz of a wobble signal, is extracted by the band pass filter 35, and, as for the difference signal V5 inputted into the band pass filter 35, this is outputted as a wobble signal WB.
[0037] Next, actuation of this operation gestalt which consists of the above-mentioned configuration is explained based on the signal waveform diagram of drawing 4 . Playback of the truck in which the information on an optical disk is recorded, namely, the pit is formed modulated the RF signal with the EFM signal. Therefore, an EFM signal is reproducible from a RF signal.
[0038] However, while the electrical potential differences V1 and V2 needed for playback of a wobble signal also become what the EFM signal mixed, the level of electrical potential differences V1 and V2 is the different thing. the EFM signal component mixed in these electrical potential differences V1 and V2 with this operation gestalt here -- ** -- by generating the electrical potential difference V4 which amended the level of an electrical potential difference V1 by the adjustable amplifying circuit 31, and generating the difference signal V5 of this electrical potential difference V4 and electrical potential difference V2 with a subtractor 32 further, the electrical potential difference V5 which an EFM component does not mix is obtained, and the wobble signal is reproduced from this electrical potential difference V5 so that it may become equal.
[0039] In amendment of the electrical potential difference V1 in the adjustable amplifier 31, only when an EFM signal was high level H, the difference signal V5 was inputted into the low pass filter 34, with the low pass filter 34, it extracted, the envelope component, i.e., the EFM signal component, of the difference signal V5, and the electrical potential difference V1 is amended by making this into control voltage Vcon.
[0040] Therefore, since level of an electrical potential difference V4 is mostly made into this level with the level of an electrical potential difference V2 as shown in drawing 4 , the noise component of an electrical potential difference V4 and an EFM signal component, the noise component of an electrical potential difference V2, and an EFM signal component are offset, and the wobble signal WB with which the noise component and the EFM signal component were reduced or removed is generated.
[0041] Here, in the signal wave form shown in drawing 4 , since control voltage Vcon is plus, the adjustable amplifying circuit 31 operates in the direction which lowers gain, and when an electrical potential difference V4 is smaller than an electrical potential difference V2, since control voltage Vcon is subtracted, it operates in the direction to which the adjustable amplifying circuit 31 raises gain.
[0042] Since the always exact wobble signal WB is reproducible with an easy configuration according to this operation gestalt as mentioned above, it is stabilized and spindle control, especially spindle control at the time of tracking-off can be performed. Furthermore, since AITP data are correctly reproducible even if eccentricity or a skew (SKEW) has arisen in the optical disk, a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.
[0043] Next, the 2nd operation gestalt of this invention is explained. Drawing 5 is the block diagram showing the 2nd operation gestalt of this invention. In drawing, the same component as the conventional example mentioned above is expressed with the same sign. the optical pickup for which 10 used the 1 beam push pull method, and 21 and 22 -- a summing amplifier and 23 -- an adder and 24 -- a subtractor, and 41A and 41B -- an adjustable amplifying circuit and 42 -- for a hold capacitor and 45, as for a low pass filter (LPF) and 47, the differential amplifier and 46 are [ a subtractor and 43 / an electronic switch and 44 / an inversed amplifier and 48 ] band pass filters (BPF). [ namely, ]
[0044] An optical pickup 10 is equipped with the photodetector 11 of well-known quadrisection, and can perform focal amendment by an astigmatism method etc. using the sum total light income of the detectors 11a and 11c located on the diagonal line in tracking amendment again using the sum total light income of the detectors 11b and 11c located in detectors [ which are located in the left-hand side of a truck / 11a and 11d ] sum total light income and right-hand side, and Detectors [ 11b and 11d ] sum total light income.
[0045] A summing amplifier 21 outputs the electrical potential difference V1 which inputted the electrical potential difference outputted from the photodetectors 11a and 11d of an optical pickup 10, and added these, and outputs the electrical potential difference V2 which the summing amplifier 22 inputted the electrical potential difference outputted from the photodetectors 11b and 11c of an optical

pickup 10, and added these.
[0046] Moreover, electrical potential differences V1 and V2 are inputted into an adder 23, while these are added and being outputted as a read-out signal (RF signal) by the adder 23, the electrical potential difference V3 of the difference of electrical potential differences V1 and V2 is generated by the subtractor 24, and this electrical potential difference V3 is outputted as a tracking error signal TE.
[0047] Furthermore, the electrical potential difference V1 outputted from the summing amplifier 21 is inputted into adjustable amplifying-circuit 41A through a coupling capacitor C1, and is inputted into the non-inversed input terminal of a subtractor 42 as an electrical potential difference Va on which the electrical-potential-difference value was changed into the predetermined value by adjustable amplifying-circuit 41A based on control voltage Vcon1.
[0048] Moreover, the electrical potential difference V2 outputted from the adder 22 is inputted into adjustable amplifier 41B through a coupling capacitor C2, and is inputted into the inversed input terminal of a subtractor 42 as an electrical potential difference Vb on which the electrical-potential-difference value was changed into the predetermined value by adjustable amplifier 41B based on control voltage Vcon2.
[0049] A subtractor 42 outputs the difference of the inputted electrical potential differences Va and Vb as a difference signal Vc. This difference signal Vc is inputted into the input terminal of the 1st contact 43a of an electronic switch 43, and a band pass filter 48.
[0050] 2nd contact 43b of an electronic switch 43 is opened wide, and contact piece 43c is grounded through the hold capacitor 44 while connecting with the non-inversed input terminal of the differential amplifier 45. Moreover, an electronic switch 43 is changed by the EFM signal reproduced from the RF signal, when an EFM signal is high-level, contact piece 43c is connected to 1st contact 43a, and contact piece 43c is connected to 2nd contact 43b at the time of a low level.
[0051] Moreover, the output terminal of the differential amplifier 45 is connected to the input terminal of a low pass filter 46 while connecting with the inversed input terminal.
[0052] Here, a sample hold circuit is constituted by an electronic switch 43, the hold capacitor 44, and the differential amplifier 45.
[0053] A predetermined frequency, for example, a frequency component 40kHz or less, will be extracted from a hold signal Vd by the low pass filter 46, and the hold signal Vd outputted from the differential amplifier 45 will be outputted as control voltage Vcon1 mentioned above, if inputted into a low pass filter 46.
[0054] Furthermore, the positive/negative is reversed by inversed amplification 47 and control voltage Vcon1 is outputted as control voltage Vcon2.
[0055] On the other hand, the frequency component in a predetermined frequency band, i.e., the frequency component in the predetermined frequency band centering on the frequency of 22.05kHz of a wobble signal, is extracted by the band pass filter 48, and, as for the difference signal Vc inputted into the band pass filter 48, this is outputted as a wobble signal WB.
[0056] According to the 2nd operation gestalt which consists of the above-mentioned configuration, when the truck in which the information on an optical disk is recorded, namely, the pit is formed was reproduced, the RF signal was modulated by the EFM signal. Therefore, an EFM signal is reproducible from a RF signal.
[0057] However, while the electrical potential differences V1 and V2 needed for playback of a wobble signal also become what the EFM signal mixed, the level of electrical potential differences V1 and V2 is the different thing.
[0058] So that the EFM signal component mixed in these electrical potential differences V1 and V2 with this operation gestalt may become equal here and the voltage level beyond a predetermined value may be obtained By generating the electrical potential differences Va and Vb which amended the level of electrical potential differences V1 and V2 by the adjustable amplifying circuits 41A and 41B, and generating the difference signal Vc of these electrical potential differences Va and Vb with a subtractor 42 further The hold signal Vd which an EFM component does not mix is obtained, and the wobble signal is reproduced from this hold signal Vd.
[0059] In amendment of the electrical potential differences V1 and V2 in the adjustable amplifier 41A and 41B, only when an EFM signal was high level H, sample hold of the difference signal Vc was carried out, with the low pass filter 46, it extracted, the envelope component, i.e., the EFM signal component, of a hold signal Vd, and the electrical potential difference V1 is amended by making this

into control voltage Vcon1. Furthermore, when control voltage Vcon1 is reversed, control voltage Vcon2 is obtained and this amends an electrical potential difference V2, push pull actuation of the adjustable amplifying circuits 41A and 41B is carried out. It enables it to reproduce a wobble signal on the fixed level optimal thereby always.

[0060] Therefore, since level of an electrical potential difference Va is mostly made into this level with the level of an electrical potential difference Vb, the noise component of an electrical potential difference Va and an EFM signal component, the noise component of an electrical potential difference Vb, and an EFM signal component are offset, and the wobble signal WB with which the noise component and the EFM signal component were reduced or removed is generated.

[0061] according to [ as mentioned above ] this operation gestalt -- an easy configuration -- always exact **** -- since the wobble signal WB of the optimal level is reproducible, it is stabilized and spindle control, especially spindle control at the time of tracking-off can be performed. Furthermore, since AITP data are correctly reproducible even if eccentricity or a skew (SKEW) has arisen in the optical disk, a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

[0062] In addition, the configuration in the 1st and 2nd operation gestalten mentioned above is an example, and it is needless to say that the invention in this application is not limited to this.

[0063]

[Effect of the Invention] As explained above, according to the wobble signal regeneration approach of the optical disk of this invention according to claim 1 Since it is offset synchronizing with an EFM signal, the noise component, i.e., the EFM signal component, of a signal of the both sides outputted from two photodetectors, and the noise component in a wobble signal is reduced or removed While an always exact wobble signal is reproducible, and being stabilized and being able to perform spindle control, especially spindle control at the time of tracking-off Even if eccentricity or SKEW has arisen in the optical disk, AITP data can be reproduced correctly, and a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

[0064] Moreover, according to the wobble signal regeneration approach of an optical disk according to claim 2 Since it is offset synchronizing with an EFM signal, the noise component, i.e., the EFM signal component, of a signal of the both sides outputted from two photodetectors, and the noise component in a wobble signal is reduced or removed While the wobble signal of the always exact optimal level is reproducible, and being stabilized and being able to perform spindle control, especially spindle control at the time of tracking-off Even if eccentricity or SKEW has arisen in the optical disk, AITP data can be reproduced correctly, and a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

[0065] Moreover, according to the wobble signal regeneration equipment of an optical disk according to claim 3 It synchronizes with an EFM signal by the easy configuration. The offset component of a wobble signal, Namely, the level of the signal outputted from one photodetector of the photodetector by which the EFM signal component was made the control signal and made the longitudinal direction of a truck 2 ****s with this control signal is controlled to become almost the same as the level of the signal outputted from the photodetector of another side. Since the noise component superimposed on both signals with the subtractor is offset, the noise component in a wobble signal can be reduced or removed. Since a wobble signal exact thereby always is reproducible, it is stabilized and spindle control, especially spindle control at the time of tracking-off can be performed. Furthermore, since AITP data are correctly reproducible even if eccentricity or SKEW has arisen in the optical disk, a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

[0066] Moreover, according to the wobble signal regeneration equipment of an optical disk according to claim 4 It synchronizes with an EFM signal by the easy configuration. The offset component of a wobble signal, Namely, the level of the signal outputted from the photodetector of the both sides of a photodetector where the EFM signal component was made into the control signal, and was made into the longitudinal direction of a truck 2 ****s by this control signal is controlled to become almost the same. Since the noise component superimposed on both signals with the subtractor is offset, the noise

component in a wobble signal can be reduced or removed. Since the wobble signal of the optimal level exact thereby always is reproducible, it is stabilized and spindle control, especially spindle control at the time of tracking-off can be performed. Furthermore, since AITP data are correctly reproducible even if eccentricity or SKEW has arisen in the optical disk, a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, the effectiveness which was very excellent that a servo can always be automatically applied to the best point of C/N is done so.

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to the wobble signal regeneration approach used for the information record regenerative apparatus of an optical disk, and its equipment.

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[Translation done.]

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PRIOR ART

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[Description of the Prior Art] As conventionally shown in the recordable optical disk 1 of a write once optical disk (CD-WO) etc. at drawing 2 , the truck 2 which winds with few amplitude beforehand (it moves in a zigzag direction) is formed in the record section in the shape of a spiral. The wave of this truck is ATIP (Absolute Time In Pregroove). The absolute time information called data is expressed, 22.05kHz is made into fundamental frequency, and the FSK (Frequency Shift Keying) modulation of that frequency is carried out so that **1kHz may change according to whether the contents of the bit, i.e., this bit, are "1", or it is "0" to every [ corresponding to 1 bit of ATIP data ] die length (seven periods with a frequency of 44.1kHz).

[0003] Moreover, ATIP data consist of frames which a large number which consist of a bit string to which one frame equipped the position with the frame alignment signal of a fixed pattern, including the bit of one constant (84 bits) followed, and each frame is repeated with the period with a frequency of 75Hz.

[0004] On the other hand, when recording information, such as voice and an image, on the recordable optical disk mentioned above, the control information showing the number of channels of music, the existence of pre-emphasis, the number of music, the time amount from the beginning of music, the absolute time from the disk most inner circumference, etc., i.e., sub-code data, is recorded on coincidence. This sub-code data consists of many frames which consist of a bit string to which one frame equipped the position with the frame alignment signal of a fixed pattern, including the bit (however, the unit length corresponding to 1 bit differing from a case with ATIP data) of fixed numbers (98 bits), and each frame is recorded with a period with a frequency of 75Hz.

[0005] Here, to actually record information on an optical disk, since it is defined by specification that frame synchronization of ATIP data and the sub-code data must be carried out, and they must be recorded, it needs to reproduce ATIP data. For this reason, when reproducing ATIP data conventionally, it reproduced as an analog signal (wobble signal) which detects the wave mentioned above and has the period of a wave, and was getting over by the FSK demodulator circuit using an analog PLL circuit etc.

[0006] However, there were the following troubles in playback of a wobble signal.

[0007] That is, a tracking error signal takes the difference of right and left of return light reflected from the optical disk on the photodetector of an optical pickup. Therefore, when an objective lens followed and moves to the eccentricity of an optical disk, naturally the spot of return light moves to right and left also on the photodetector in an optical pickup. Here, although a noise is not overlapped on a tracking error signal if considering the case where a noise is in return light all the incident light reinforcement to each photodetector is these level, when the level of incident light reinforcement on either side differs, a noise and an EFM signal component will be overlapped on a tracking error signal, and C/N of the wobble signal WB will be reduced.

[0008] for example, to the optical disk of a postscript mold which was mentioned above When a wobble signal is reproduced in the field where information was recorded, and the field to which a non-recorded field exists and information is recorded, If eccentricity etc. is in an optical disk, it will be overlapped on a wobble signal, the signal component, i.e., the EFM signal component, of recording information, and C/N will be reduced, ATIP data will not be able to be reproduced correctly, but big trouble will be caused to a search, and a malfunction will be caused.

[0009] In order to reduce such a malfunction, by the 1 beam push pull method, the wobble signal was reproduced by circuitry which is indicated by JP,6-44568,A.

[0010] That is, wobble signal regeneration equipment consists of Adders 71A and 71B, Subtractors 72A and 72B, coupling capacitors 73A-73C, the adjustable amplifying circuit 74, clamping circuits 75A and 75B, peak hold circuits 76A and 76B, an amplifying circuit 77, and a band pass filter (BPF) 78, as shown in drawing 3 .

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[0011] Moreover, 10 is an optical pickup and the photodetector 11 of well-known quadrisection is used as a photodetector 11 which receives the reflected light from an optical disk. Moreover, the electrical potential differences V1 and V2 corresponding to the sum total light income of the detectors 11b and 11c located in detectors [ which are located in the left-hand side of a truck / 11a and 11d ] sum total light income and right-hand side are generated by summing amplifiers 71A and 71B.

[0012] Here, in electrical potential differences V1 and V2, when the quantity of light of the reflected light beam from an optical disk changes according to a pit in the predetermined range and a groove changes to radial [ of a light beam ], where bias only of the predetermined level is carried out, according to a pit, it changes a period with short signal level, and the whole signal level is further changed according to a groove.

[0013] On the other hand, an electrical potential difference V1 is inputted into the adjustable amplifying circuit 74 through coupling-capacitor 73A, and the electrical potential difference V2 is inputted into the non-inversed input terminal of clamping circuit 75B and subtraction machine 72A as a signal S2 through coupling-capacitor 73B.

[0014] Moreover, the output signal S1 from the adjustable amplifying circuit 74 is inputted into the inversed input terminal of clamping circuit 75A and subtraction machine 72A through coupling-capacitor 73C.

[0015] The output signal of clamping circuit 75A is inputted into the inversed input terminal of subtraction machine 72B as a signal S3 through peak hold circuit 76A, and the output signal of clamping circuit 75B is inputted into the non-inversed input terminal of subtraction machine 72B as signal S4 through peak hold circuit 76B. Furthermore, after the output signal S5 of subtraction machine 72B is amplified by amplifier 77, it is inputted into the adjustable amplifying circuit 74 as a control signal.

[0016] Moreover, the wobble signal WB is reproduced by letting the output signal of subtraction machine 72A pass to a band pass filter 78.

[0017] According to the above-mentioned configuration, the signal level of RF component which changes according to a pit is between an input signal S1 and S2, and after amending the signal level of an input signal S1 so that it may become equal, since these difference signals are generated and it is reproducing as a wobble signal WB, even when the incidence location of the reflected light beam to the optical pickup 10 changes by secular change etc., mixing of RF component to the wobble signal WB can be reduced.

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[Translation done.]

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## EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to the wobble signal regeneration approach of the optical disk of this invention according to claim 1, it synchronizes with an EFM signal, Since it is offset, the noise component, i.e., the EFM signal component, of a signal of the both sides outputted from two photodetectors, and the noise component in a wobble signal is reduced or removed, an always exact wobble signal is reproducible, while being stabilized and being able to perform spindle control, especially spindle control at the time of tracking-off, even if eccentricity or SKEW has arisen in the optical disk, AITP data can be reproduced correctly, and a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

[0064] Moreover, according to the wobble signal regeneration approach of an optical disk according to claim 2, it synchronizes with an EFM signal, Since it is offset, the noise component, i.e., the EFM signal component, of a signal of the both sides outputted from two photodetectors, and the noise component in a wobble signal is reduced or removed While the wobble signal of the always exact optimal level is reproducible, and being stabilized and being able to perform spindle control, especially spindle control at the time of tracking-off Even if eccentricity or SKEW has arisen in the optical disk, AITP data can be reproduced correctly, and a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

[0065] Moreover, according to the wobble signal regeneration equipment of an optical disk according to claim 3, it synchronizes with an EFM signal by the easy configuration, The level of the signal outputted from one photodetector of the photodetector by which it was made the control signal, the offset component, i.e., the EFM signal component, of a wobble signal, and it was made the longitudinal direction of a truck 2 ****s with this control signal is controlled to become almost the same as the level of the signal outputted from the photodetector of another side, and since the noise component superimposed on both signals with the subtractor is offset, the noise component in a wobble signal can be reduced or removed. Since a wobble signal exact thereby always is reproducible, it is stabilized and spindle control, especially spindle control at the time of tracking-off can be performed. Furthermore, since AITP data are correctly reproducible even if eccentricity or SKEW has arisen in the optical disk, a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

[0066] Moreover, according to the wobble signal regeneration equipment of an optical disk according to claim 4, it synchronizes with an EFM signal by the easy configuration, The level of the signal outputted from the photodetector of the both sides of a photodetector where it was made into the control signal, the offset component, i.e., the EFM signal component, of a wobble signal, and it was made into the longitudinal direction of a truck 2 ****s by this control signal is controlled to become almost the same, and since the noise component superimposed on both signals with the subtractor is offset, the noise component in a wobble signal can be reduced or removed. Since the wobble signal of the optimal level exact thereby always is reproducible, it is stabilized and spindle control, especially spindle control at the time of tracking-off can be performed. Furthermore, since AITP data are correctly reproducible even if eccentricity or SKEW has arisen in the optical disk, a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change,

the effectiveness which was very excellent that a servo can always be automatically applied to the best point of C/N is done so.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, it had the trouble of components mark having increased and becoming cost quantity while the conventional wobble signal regeneration equipment mentioned above had the complicated configuration.
[0019] The purpose of this invention is to offer the wobble signal regeneration approach of the optical disk which can reproduce an always exact wobble signal by the easy configuration, and its equipment in view of the above-mentioned trouble.

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MEANS

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[Means for Solving the Problem] This invention in order to attain the above-mentioned purpose in claim 1 The reflected light from the optical disk with which it has the truck moved in a zigzag direction and formed based on absolute time information, there was along this truck, and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration approach of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on a control signal. The difference signal which has the level of a difference with the level of this signal by which level change was carried out, and the signal outputted from the photodetector of another side is generated. After carrying out sample hold of said difference signal based on the EFM signal acquired from said reflected light, The wobble signal regeneration approach of the optical disk which reproduces said control signal, and nothing and said difference signal for this sample hold signal as a wobble signal through a band-pass filter through a low-pass filter is proposed.
[0021] As for the level of the signal outputted from one photodetector of the photodetector which receives the reflected light from the optical disk set as the informational record playback object, and which was carried out 2 ****s, according to the wobble signal regeneration approach of this optical disk, the level changes with control signals. Furthermore, the difference signal which has the level of the difference of the level of this signal by which level change was carried out, and the level of the signal outputted from the photodetector of another side is generated, and a wobble signal is reproduced by letting a band-pass filter pass in this difference signal. Based on the EFM signal with which said control signal was acquired from the reflected light from an optical disk, sample hold of said difference signal is carried out here. Since it is furthermore generated through a low-pass filter, the output-signal level from one [ said ] photodetector is changed corresponding to an EFM signal and offset of the output-signal level from both photodetectors is mostly made into this level An EFM signal component in phase is offset in the noise component of both signals outputted from said two photodetectors, i.e., both signals, and the noise component in a wobble signal is reduced or removed.
[0022] Moreover, it has the truck moved in a zigzag direction and formed in claim 2 based on absolute time information. The reflected light from the optical disk with which there was it along this truck and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration approach of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The level of the signal outputted from the photodetector of both said photodetectors carried out 2 ****s is changed based on the 1st control signal and the 2nd control signal, respectively. The difference signal which has the level of the difference of this signal level by which level change was carried out is generated. After carrying out sample hold of said difference signal based on the EFM signal acquired from said reflected light, while making this sample hold signal with said 1st control signal through a low-pass filter The wobble signal regeneration approach of the optical disk which reverses this 1st control signal and reproduces said 2nd control signal, and nothing and said sample hold signal as a wobble signal through a band-pass filter is proposed.
[0023] As for the level of the signal outputted from the photodetector of the both sides of the photodetector which receives the reflected light from the optical disk set as the informational record playback object, and which was carried out 2 ****s, according to the wobble signal regeneration

approach of this optical disk, the level changes with the 1st and 2nd control signals. Moreover, the difference signal which has the level of the difference of this signal level by which level change was carried out is generated, sample hold is carried out based on the EFM signal which was able to acquire this difference signal from the reflected light from an optical disk, and a wobble signal is further reproduced by letting a band-pass filter pass in this signal that carried out sample hold. Moreover, said 1st control signal is generated by letting a low-pass filter pass in said signal by which sample hold was carried out, and said 2nd control signal is generated by reversing said 1st control signal. Based on an EFM signal, sample hold of said 1st and 2nd control signals is carried out, and they are generated here. Since the output-signal level from the photodetector of said both sides is changed corresponding to an EFM signal and offset of the output-signal level from both photodetectors is mostly made into this level While an EFM signal component in phase is offset in the noise component of both signals outputted from said two photodetectors, i.e., both signals, and the noise component in a wobble signal is reduced or removed Maintenance on fixed level is almost attained in the level of the wobble signal reproduced.

[0024] Moreover, it has the truck moved in a zigzag direction and formed in claim 3 based on absolute time information. The reflected light from the optical disk with which there was it along this truck and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration equipment of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The adjustable amplifying circuit which the level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on a control signal, and outputs it, The subtractor circuit which outputs the signal which has the level of the difference of the level of the signal outputted from the photodetector of another side of said photodetector carried out 2 ****s, and the level of the output signal of said adjustable amplifying circuit, The sample hold circuit which carries out sample hold of the output signal of said subtractor circuit based on the EFM signal acquired from the reflected light from said optical disk, The low-pass filter which outputs only the frequency component below the predetermined frequency in the output signal of this sample hold circuit as said control signal, The output signal of said subtractor circuit is inputted and the wobble signal regeneration equipment of the optical disk equipped with the band-pass filter which outputs the signal of the frequency in the predetermined frequency band containing the frequency of the wobble signal in this signal is proposed.

[0025] According to the wobble signal regeneration equipment of this optical disk, the level of the signal outputted from one photodetector of the photodetector which receives the reflected light from the optical disk set as the informational record playback object, and which was carried out 2 ****s It changes with adjustable amplifying circuits based on a control signal, and the difference signal which has the level of the difference of the level of the signal outputted by the subtractor circuit from the photodetector of another side of said photodetector carried out 2 ****s and the level of the output signal of said adjustable amplifying circuit is outputted. Moreover, it is outputted as said control signal with a low-pass filter, the frequency component, i.e., the offset component, below the predetermined frequency in the output signal of said subtractor circuit. Here, based on the EFM signal acquired from the reflected light from an optical disk, sample hold of said difference signal is carried out, it is generated, and the control signal outputted from said low-pass filter changes the output signal level from one [ said ] photodetector corresponding to an EFM signal. Furthermore, since said control signal turns into a signal outputted from said adjustable amplifying circuit, and a signal which has the level corresponding to the level difference of the signal outputted from the photodetector of said another side only when the EFM signal acquired from the reflected light from said optical disk exists, By controlling the level of the signal outputted from one [ said ] photodetector by this control signal to become almost the same as the level of the signal outputted from the photodetector of said another side Both noise components are offset in said subtractor, and the noise component in the signal outputted from said subtractor, i.e., a wobble signal, is reduced or removed. Furthermore, with a band-pass filter, the signal of the frequency in the predetermined frequency band containing the frequency of the wobble signal in the output signal of said subtractor circuit is outputted, and a wobble signal is reproduced.

[0026] Moreover, it has the truck moved in a zigzag direction and formed in claim 4 based on absolute time information. The reflected light from the optical disk with which there was it along this truck and the pit was formed is detected using the photodetector made into the longitudinal direction of said truck 2 ****s at least. In the wobble signal regeneration equipment of the optical disk which reproduces the wobble signal which changes from this detection result corresponding to meandering of said truck The

1st adjustable amplifying circuit which the level of the signal outputted from one photodetector of said photodetector carried out 2 ****s is changed based on the 1st control signal, and outputs it, The 2nd adjustable amplifying circuit which the level of the signal outputted from the photodetector of another side of said photodetector carried out 2 ****s is changed based on the 2nd control signal, and outputs it, The subtractor circuit which outputs the signal which has the level of the difference of the output-signal level of said 1st adjustable amplifier, and the output-signal level of said 2nd adjustable amplifying circuit, The sample hold circuit which carries out sample hold of the output signal of said subtractor circuit based on the EFM signal acquired from the reflected light from said optical disk, The low-pass filter which outputs only the frequency component below the predetermined frequency in the output signal of this sample hold circuit as said 1st control signal, The inverter circuit which reverses said 1st control signal and is outputted as said 2nd control signal, The output signal of said sample hold circuit is inputted, and the wobble signal regeneration equipment of the optical disk equipped with the band-pass filter which outputs the signal of the frequency in the predetermined frequency band containing the frequency of the wobble signal in this signal is proposed.

[0027] According to the wobble signal regeneration equipment of this optical disk, the level of the signal outputted from one photodetector of the photodetector which receives the reflected light from the optical disk set as the informational record playback object, and which was carried out 2 ****s changes with the 1st and 2nd adjustable amplifying circuits based on the 1st and 2nd control signals, respectively, and the difference signal which has the level of the difference of the output signal level of said 1st and 2nd adjustable amplifying circuits is outputted by the subtractor circuit. Moreover, it is outputted as said 1st control signal with a low-pass filter, the frequency component, i.e., the offset component, below the predetermined frequency in the output signal of said subtractor circuit. Here, based on the EFM signal acquired from the reflected light from an optical disk, sample hold of said difference signal is carried out, it is generated, and the 1st control signal outputted from said low-pass filter changes the output signal level from one [ said ] photodetector corresponding to an EFM signal. Moreover, said 2nd control signal is generated by reversing said 1st control signal by the inverter circuit. Furthermore, since said 1st and 2nd control signals turn into a signal which has the level corresponding to the difference of the signal level outputted from said 1st and 2nd adjustable amplifying circuits only when the EFM signal acquired from the reflected light from said optical disk exists, By controlling the level of the signal outputted from the photodetector of said both sides by this control signal to become almost the same Both noise components are offset in said subtractor, and while the noise component in the signal outputted from said subtractor, i.e., a wobble signal, is reduced or removed, maintenance on fixed level is almost attained in the level of the wobble signal reproduced. Furthermore, with a band-pass filter, the signal of the frequency in the predetermined frequency band containing the frequency of the wobble signal in the output signal of said sample hold circuit is outputted, and a wobble signal is reproduced.

[0028]

[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained based on a drawing. Drawing 1 is the block diagram showing the 1st operation gestalt of this invention. In drawing, the same component as the conventional example mentioned above is expressed with the same sign. the optical pickup for which 10 used the 1 beam push pull method, and 21 and 22 -- a summing amplifier and 23 -- an adder and 24 -- for a subtractor and 33, as for a low pass filter (LPF) and 35, an electronic switch and 34 are [ a subtractor and 31 / an adjustable amplifying circuit and 32 / a band pass filter (BPF) and 36 ] hold capacitors. [ namely, ]

[0029] An optical pickup 10 is equipped with the photodetector 11 of well-known quadrisection, and can perform focal amendment by an astigmatism method etc. using the sum total light income of the detectors 11a and 11c located on the diagonal line in tracking amendment again using the sum total light income of the detectors 11b and 11c located in detectors [ which are located in the left-hand side of a truck / 11a and 11d ] sum total light income and right-hand side, and Detectors [ 11b and 11d ] sum total light income.

[0030] A summing amplifier 21 outputs the electrical potential difference V1 which inputted the electrical potential difference outputted from the photodetectors 11a and 11d of an optical pickup 10, and added these, and outputs the electrical potential difference V2 which the summing amplifier 22 inputted the electrical potential difference outputted from the photodetectors 11b and 11c of an optical pickup 10, and added these.

[0031] Moreover, electrical potential differences V1 and V2 are inputted into an adder 23, while these

are added and being outputted as a read-out signal (RF signal) by the adder 23, the electrical potential difference V3 of the difference of electrical potential differences V1 and V2 is generated by the subtractor 24, and this electrical potential difference V3 is outputted as a tracking error signal TE. (21)
[0032] Furthermore, the electrical potential difference V1 outputted from the summing amplifier 21 is inputted into the adjustable amplifying circuit 31 through a coupling capacitor C1, and is inputted into a subtractor 32 as an electrical potential difference V4 on which the electrical-potential-difference value was changed into the predetermined value by the adjustable amplifying circuit 31 based on control voltage Vcon. An electrical potential difference V4 is inputted into the non-inversed input terminal of a subtractor 32, an electrical potential difference V2 is inputted into an inversed input terminal through a coupling capacitor C2, and a subtractor 32 outputs these differences as a difference signal V5. This difference signal V5 is inputted into a band pass filter 35 while it is inputted into 1st contact 33a of an electronic switch 33.
[0033] 2nd contact 33b of an electronic switch 33 is opened wide, and contact piece 33c is grounded through the hold capacitor 36 while connecting with the input terminal of a low pass filter 34. Moreover, an electronic switch 33 is changed by the EFM signal reproduced from the RF signal, when an EFM signal is high-level, contact piece 33c is connected to 1st contact 33a, and contact piece 33c is connected to 2nd contact 33b at the time of a low level.
[0034] Here, a sample hold circuit is constituted by an electronic switch 33 and the hold capacitor 36.
[0035] A predetermined frequency, for example, a frequency component 40kHz or less, will be extracted from the difference signal V5 by the low pass filter 34, and the difference signal V5 will be outputted as control voltage Vcon mentioned above, if inputted into a low pass filter 42 through an electronic switch 33.
[0036] On the other hand, the frequency component in a predetermined frequency band, i.e., the frequency component in the predetermined frequency band centering on the frequency of 22.05kHz of a wobble signal, is extracted by the band pass filter 35, and, as for the difference signal V5 inputted into the band pass filter 35, this is outputted as a wobble signal WB.
[0037] Next, actuation of this operation gestalt which consists of the above-mentioned configuration is explained based on the signal waveform diagram of drawing 4 . Playback of the truck in which the information on an optical disk is recorded, namely, the pit is formed modulated the RF signal with the EFM signal. Therefore, an EFM signal is reproducible from a RF signal.
[0038] However, while the electrical potential differences V1 and V2 needed for playback of a wobble signal also become what the EFM signal mixed, the level of electrical potential differences V1 and V2 is the different thing. the EFM signal component mixed in these electrical potential differences V1 and V2 with this operation gestalt here -- ** -- by generating the electrical potential difference V4 which amended the level of an electrical potential difference V1 by the adjustable amplifying circuit 31, and generating the difference signal V5 of this electrical potential difference V4 and electrical potential difference V2 with a subtractor 32 further, the electrical potential difference V5 which an EFM component does not mix is obtained, and the wobble signal is reproduced from this electrical potential difference V5 so that it may become equal.
[0039] In amendment of the electrical potential difference V1 in the adjustable amplifier 31, only when an EFM signal was high level H, the difference signal V5 was inputted into the low pass filter 34, with the low pass filter 34, it extracted, the envelope component, i.e., the EFM signal component, of the difference signal V5, and the electrical potential difference V1 is amended by making this into control voltage Vcon.
[0040] Therefore, since level of an electrical potential difference V4 is mostly made into this level with the level of an electrical potential difference V2 as shown in drawing 4 , the noise component of an electrical potential difference V4 and an EFM signal component, the noise component of an electrical potential difference V2, and an EFM signal component are offset, and the wobble signal WB with which the noise component and the EFM signal component were reduced or removed is generated.
[0041] Here, in the signal wave form shown in drawing 4 , since control voltage Vcon is plus, the adjustable amplifying circuit 31 operates in the direction which lowers gain, and when an electrical potential difference V4 is smaller than an electrical potential difference V2, since control voltage Vcon is subtracted, it operates in the direction to which the adjustable amplifying circuit 31 raises gain.
[0042] Since the always exact wobble signal WB is reproducible with an easy configuration according to this operation gestalt as mentioned above, it is stabilized and spindle control, especially spindle

control at the time of tracking-off can be performed. Furthermore, since AITP data are correctly reproducible even if eccentricity or a skew (SKEW) has arisen in the optical disk, a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

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[0043] Next, the 2nd operation gestalt of this invention is explained. Drawing 5 is the block diagram showing the 2nd operation gestalt of this invention. In drawing, the same component as the conventional example mentioned above is expressed with the same sign. the optical pickup for which 10 used the 1 beam push pull method, and 21 and 22 -- a summing amplifier and 23 -- an adder and 24 -- a subtractor, and 41A and 41B -- an adjustable amplifying circuit and 42 -- for a hold capacitor and 45, as for a low pass filter (LPF) and 47, the differential amplifier and 46 are [ a subtractor and 43 / an electronic switch and 44 / an inversed amplifier and 48 ] band pass filters (BPF). [ namely, ]

[0044] An optical pickup 10 is equipped with the photodetector 11 of well-known quadrisection, and can perform focal amendment by an astigmatism method etc. using the sum total light income of the detectors 11a and 11c located on the diagonal line in tracking amendment again using the sum total light income of the detectors 11b and 11c located in detectors [ which are located in the left-hand side of a truck / 11a and 11d ] sum total light income and right-hand side, and Detectors [ 11b and 11d ] sum total light income.

[0045] A summing amplifier 21 outputs the electrical potential difference V1 which inputted the electrical potential difference outputted from the photodetectors 11a and 11d of an optical pickup 10, and added these, and outputs the electrical potential difference V2 which the summing amplifier 22 inputted the electrical potential difference outputted from the photodetectors 11b and 11c of an optical pickup 10, and added these.

[0046] Moreover, electrical potential differences V1 and V2 are inputted into an adder 23, while these are added and being outputted as a read-out signal (RF signal) by the adder 23, the electrical potential difference V3 of the difference of electrical potential differences V1 and V2 is generated by the subtractor 24, and this electrical potential difference V3 is outputted as a tracking error signal TE.

[0047] Furthermore, the electrical potential difference V1 outputted from the summing amplifier 21 is inputted into adjustable amplifying-circuit 41A through a coupling capacitor C1, and is inputted into the non-inversed input terminal of a subtractor 42 as an electrical potential difference Va on which the electrical-potential-difference value was changed into the predetermined value by adjustable amplifying-circuit 41A based on control voltage Vcon1.

[0048] Moreover, the electrical potential difference V2 outputted from the adder 22 is inputted into adjustable amplifier 41B through a coupling capacitor C2, and is inputted into the inversed input terminal of a subtractor 42 as an electrical potential difference Vb on which the electrical-potential-difference value was changed into the predetermined value by adjustable amplifier 41B based on control voltage Vcon2.

[0049] A subtractor 42 outputs the difference of the inputted electrical potential differences Va and Vb as a difference signal Vc. This difference signal Vc is inputted into the input terminal of the 1st contact 43a of an electronic switch 43, and a band pass filter 48.

[0050] 2nd contact 43b of an electronic switch 43 is opened wide, and contact piece 43c is grounded through the hold capacitor 44 while connecting with the non-inversed input terminal of the differential amplifier 45. Moreover, an electronic switch 43 is changed by the EFM signal reproduced from the RF signal, when an EFM signal is high-level, contact piece 43c is connected to 1st contact 43a, and contact piece 43c is connected to 2nd contact 43b at the time of a low level.

[0051] Moreover, the output terminal of the differential amplifier 45 is connected to the input terminal of a low pass filter 46 while connecting with the inversed input terminal.

[0052] Here, a sample hold circuit is constituted by an electronic switch 43, the hold capacitor 44, and the differential amplifier 45.

[0053] A predetermined frequency, for example, a frequency component 40kHz or less, will be extracted from a hold signal Vd by the low pass filter 46, and the hold signal Vd outputted from the differential amplifier 45 will be outputted as control voltage Vcon1 mentioned above, if inputted into a low pass filter 46.

[0054] Furthermore, the positive/negative is reversed by inversed amplification 47 and control voltage Vcon1 is outputted as control voltage Vcon2.

[0055] On the other hand, the frequency component in a predetermined frequency band, i.e., the

frequency component in the predetermined frequency band centering on the frequency of 22.05kHz of a wobble signal, is extracted by the band pass filter 48, and, as for the difference signal Vc inputted into the band pass filter 48, this is outputted as a wobble signal WB.

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[0056] According to the 2nd operation gestalt which consists of the above-mentioned configuration, when the truck in which the information on an optical disk is recorded, namely, the pit is formed was reproduced, the RF signal was modulated by the EFM signal. Therefore, an EFM signal is reproducible from a RF signal.

[0057] However, while the electrical potential differences V1 and V2 needed for playback of a wobble signal also become what the EFM signal mixed, the level of electrical potential differences V1 and V2 is the different thing.

[0058] So that the EFM signal component mixed in these electrical potential differences V1 and V2 with this operation gestalt may become equal here and the voltage level beyond a predetermined value may be obtained By generating the electrical potential differences Va and Vb which amended the level of electrical potential differences V1 and V2 by the adjustable amplifying circuits 41A and 41B, and generating the difference signal Vc of these electrical potential differences Va and Vb with a subtractor 42 further The hold signal Vd which an EFM component does not mix is obtained, and the wobble signal is reproduced from this hold signal Vd.

[0059] In amendment of the electrical potential differences V1 and V2 in the adjustable amplifier 41A and 41B, only when an EFM signal was high level H, sample hold of the difference signal Vc was carried out, with the low pass filter 46, it extracted, the envelope component, i.e., the EFM signal component, of a hold signal Vd, and the electrical potential difference V1 is amended by making this into control voltage Vcon1. Furthermore, when control voltage Vcon1 is reversed, control voltage Vcon2 is obtained and this amends an electrical potential difference V2, push pull actuation of the adjustable amplifying circuits 41A and 41B is carried out. It enables it to reproduce a wobble signal on the fixed level optimal thereby always.

[0060] Therefore, since level of an electrical potential difference Va is mostly made into this level with the level of an electrical potential difference Vb, the noise component of an electrical potential difference Va and an EFM signal component, the noise component of an electrical potential difference Vb, and an EFM signal component are offset, and the wobble signal WB with which the noise component and the EFM signal component were reduced or removed is generated.

[0061] according to [ as mentioned above ] this operation gestalt -- an easy configuration -- always exact **** -- since the wobble signal WB of the optimal level is reproducible, it is stabilized and spindle control, especially spindle control at the time of tracking-off can be performed. Furthermore, since AITP data are correctly reproducible even if eccentricity or a skew (SKEW) has arisen in the optical disk, a search mistake can be reduced sharply. Furthermore, even if secular change of an optical pickup and the property of optical disk media change, a servo can always be automatically applied to the best point of C/N.

[0062] In addition, the configuration in the 1st and 2nd operation gestalten mentioned above is an example, and it is needless to say that the invention in this application is not limited to this.

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[Translation done.]

(24)

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1] The block diagram showing the 1st operation gestalt of this invention
[Drawing 2] Drawing explaining the truck currently formed in the optical disk
[Drawing 3] The block diagram showing the conventional example
[Drawing 4] The signal waveform diagram explaining actuation of the 1st operation gestalt of this invention
[Drawing 5] The block diagram showing the 2nd operation gestalt of this invention
[Description of Notations]
10 -- an optical pickup, a 11a-11d-- photodetector, 21, 22 -- summing amplifier, and 23 -- an adder, 24 -- subtractor, a 31 -- adjustable amplifying circuit, and 32 -- a subtractor, 33 -- electronic switch, 34 -- low pass filter, and 35 -- a band pass filter, 41A, a 41B-- adjustable amplifier, 42 -- subtractor, and 43 -- an electronic switch, 44 -- hold capacitor, 45 -- differential amplifier, and 46 -- a low pass filter, 47 -- inversed amplifier, and 48 -- band pass filter.

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[Translation done.]